

AMERICA'S SHIPBUILDING EFFORT. See p. 376.

MR. WALTER POLLOCK ON REINFORCED CONCRETE VESSELS (Illus.). See p. 385.

SHIPBUILDING AND SHIPPING RECORD

A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

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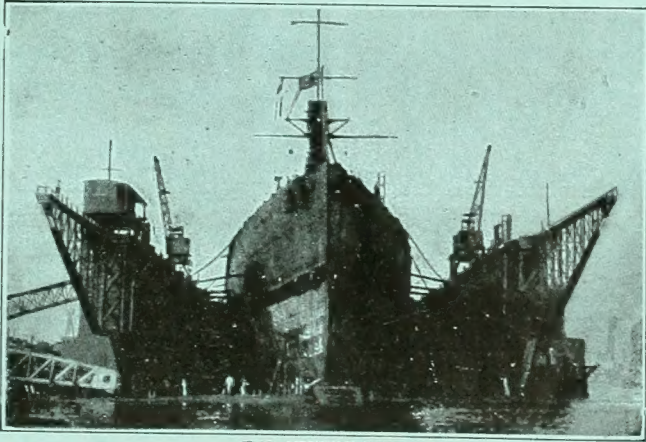


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CONTENTS.

EDITORIALS:	Sailing Ships—Limitation Rates, U.K.—France.....	379
The National Yards.....	373	
Insurance of Concrete Ships.....	373	
Another Emergency Loss Settlement.....	373	
British Metal Bank.....	373	
State and Shipping.....	373	
State-Owned Tonnage.....	374	
German Navigation Schools.....	374	
Dutch Ships and German Submarines.....	374	
The Old Question.....	374	
War and Marine Perils.....	375	
Fabricated Ships.....	375	
Colonial Shipbuilding.....	375	
Protection of Tail Shafting.....	375	
Steam Turbine Glands.....	375	
American Shipbuilding.....	376	
Labour's Aggressive Minority.....	376	
Cargo Ships.....	377	
Trade Publications.....	378	
LETTERS TO THE EDITOR:		
Lord Inchcape and the Chepstow Shipyard.....	378	
ILLUSTRATED:		
The Terry Turbine-Driven Fans.....	383	
Reinforced Concrete Vessels.....	385	
MISCELLANEOUS:		
The Effects of Explosions of Mines and Torpedoes on Merchant Ships.....	379	
The American Shipbuilding Effort, Over 8,000,000 Tons Deadweight under Construction.....	380	
Application of Electricity to Various Auxiliaries on Shipboard.....	381	
South Australian Harbour Regulations.....	382	
Institution of Naval Architects.....	390	
GENERAL NEWS SECTION.....	393	
SHIP SALES.....	399	
SHARE TABLE.....	400	

LORD INCHEAPE has rendered a great service to the public at large, and particularly to the shipbuilding community, in drawing attention to the definite loss of tonnage which has resulted from the "national shipyard" policy of the Government. It has frequently been asserted—the Earl of Durham emphasised the point in his address to the Institution of Naval Architects a fortnight ago—that the prime cause of the poor output of ships is the unfortunate and clogging interference of Government officials, and no more damaging evidence of this has been made public than that contained in Lord Inchcape's letter which we publish on page 378. Briefly, it may be stated that foreseeing the possibility of a shortage of merchant tonnage at the end of 1915, and actuated by patriotic motives, Lord Inchcape and his friends ventured £600,000 upon an up-to-date shipbuilding yard at Chepstow, and got to work expeditiously to lay down eight slipways, each capable of accommodating vessels with a carrying capacity of 10,000 tons. Two would have been ready by last October, and two more by now. Vessels would have been laid down upon them, and in the case of the first two, would have been well on their way to the water. Estimates are certainly liable to be rather out in these days, but the fact that, according to Lord Inchcape, not a single ship has been laid down, and that there is very little more, if any, plant or machinery on the place than when the Government took the place over, demands investigation and a speedy reply from the Government. The report that Mr. Noel Peck is taking a prominent part in the management and that Major-General Grey has been appointed there, may be taken as an indication of "speeding up."

There has been so much written about concrete ships and their possibilities recently, that the insurance aspect of the matter may well be given some attention. Here the underwriter will find himself entirely at the mercy of the surveyor and the expert constructional theorist at first, for until some experience of ocean-going concrete vessels has been obtained, no data on which to base premium assessments will be available. It would seem that the questions to be solved are chiefly as to the behaviour of these vessels when involved in casualties. For instance, the power of resistance when stranded in heavy seas; the probable effect of a collision, either with another vessel or a fixed object such as a pier, and the damage likely to result from a fire. These, and similar questions, must all be taken into consideration when first the insurances of concrete vessels come to be placed in the market. Another and even more important matter that will have to be gone into is that of repairs. The bulk of the settlements on hull underwriting accounts consist of average claims, and it is obvious that the cost of repairs must figure largely in the difficult proposition of fixing rates on a class of vessel hitherto unknown as an insurable interest.

We have several times had occasion to remark upon the emergency methods of settling involved situations which have arisen, in the insurance market, owing to various causes. Of these, the settlement of losses on missing vessels, as loans, pending the decision of an arbitrator as to the nature of the loss, is one of the most important. A recent case, by which the same principle has been applied to a stranded vessel, shows an interesting variation. There is, of course, no question of a war loss in this instance, but there is doubt as to whether the claim will be one for average or for total loss, and, since the vessel has been ashore for some time, and further salvage operations are likely to be protracted, it has been decided to clear the matter up by collecting from the underwriters a total loss. There is still the chance, nevertheless, that the vessel may be ultimately floated, and since, under present conditions, the owner would be loth to abandon his interest to the underwriters, it has been agreed that in the event of successful salvage operations the underwriters are to be placed in the position of having settled an amount "on account," and the claim is to be adjusted in the usual manner. Since it is possible for an average claim with salvage and sue and labour charges to amount to well over 100 per cent. of the insured value, it will be seen that the owner has obtained very favourable conditions.

We referred a few weeks ago to the formation of a British Metal Bank, the object of which was to develop within the Empire the metal industry which, before the war, was largely in German hands. The National Metal and Chemical Bank—to give it its full name—was registered last week with a capital of £1,000,000, all of which has been subscribed by the promoters and those associated with them. The articles of association conform to the model laid down by the Board of Trade for adoption by companies engaged in vital industries. None but British subjects may become directors of the bank, and provision is made to prevent the control from passing into the hands of foreign interests. The bank will devote its activities primarily to developing the smelting and chemical industries of the Empire, and it will be in a position by reason of its connections with the various British metal concerns to offer wider financial facilities to those engaged in the metal business than any ordinary bank, since it will keep a special staff of expert advisers capable of reporting on the technical merits of a mining or smelting proposition. Very considerable progress has already been made in erecting the necessary smelters and refineries in this country to treat the raw materials produced in the Empire, and a consolidation of Allied interests has been effected which will go a long way towards rendering this country independent of German supplies of certain metals.

The other day the writer of an editorial article in a Northern newspaper expressed a hope that the Government would retain and operate the ships it was now building in order to help to pay for the war. Nobody could wish British shipowners any better luck than that the State should make such an experiment, for, if one fact is emphasised more than another by the present control it is that Departmentalism is incapable of making anything pay. At first sight, that looks like condemnation of all the business men (including shipowners) who are at present serving the State. But, in reality, it is nothing of the kind, for the control which the business men are exercising is State control, whose objects are strictly defined and regarded as absolutely without alternatives. Its inelasticity is, in fact, the traditional inelasticity of Departmentalism, which will, as sure as Fate, bring British shipping to a standstill, if ever it is given an opportunity to do so. Our contemporary's hope is, of course, an outcome of the popular delusion that British shipping is fabulously profitable. Time may safely be left to restore the man in the street's sanity on that point. In the meantime, he may do worse than devote a little of his leisure to an examination of this aspect of the question: Is our war debt likely to be reduced more quickly out of profits earned by a State-owned fleet or out of an expansion of the general national revenue brought about by a restoration of a privately-owned enterprising and progressive mercantile marine? There is no need to say what we believe to be the only possible answer, and we have no doubt that the public will eventually share our view.

How far the present movement in favour of State ownership of the mercantile marine will extend before the public realise the waste of money eventually involved we have no means of knowing. At a time when freights in the open market are at a record height in consequence of the unprecedented world-wide demand for tonnage, and the difficulty, if not actual impossibility, of satisfying requirements in this respect, it is a comparatively easy matter to run vessels even under Government management at a profit, but when conditions are again normal, the situation will be more difficult. There is every reason to believe that, so far as this country is concerned, there will, after the cessation of hostilities, with the exception of a year or two's control, be no State interference with merchant shipping, but elsewhere, apparently, it is to be otherwise. In Canada, as we have already indicated, a fairly extensive construction programme is to be carried out on behalf of the Government, which will use the vessels in co-operation with the public-owned railways. For over a year, the Commonwealth of Australia has been in possession of the nucleus of a State fleet, and now, in South Africa, the Nationalists are endeavouring to proceed on similar lines, without, however, any possible chance of success. In view of the serious obstacles that were encountered before the existing mail contract came into operation, the attempt is not meeting with any influential support. Some of the Continental countries, notably Scandinavia and Spain, appear to have ambitions in the direction of State ownership, and so have several of the South American Republics, but, on the whole, most dependence will in the future, as in the past, be placed on private enterprise.

A comprehensive scheme of reorganisation is to be put in force in German navigation schools, the preparatory schools being abolished and the number of ordinary schools being reduced so as to permit of more efficient staffing and control. Hitherto the facilities for instruction have been split up to such an extent that they could not be utilised efficiently. The average attendance at the preparatory schools has been very low; and placing several higher schools under one director was found

to be both commercially and educationally inefficient. Under the new scheme the preparatory schools at Prerow, Grunendeich, Emden and Westerhauderfehn will be abolished; so also will the less important navigation schools at Pillau, Stralsund, Barth, Apenrade, Timmel and Papenburg. The remaining schools at Danzig, Stettin, Flensburg, Altona, Geestemunde and Leer will have larger classes, and each of these schools will have its own director. For the six schools there will be in future six directors and 32 teachers (instead of three directors, 30 higher and 18 preparatory teachers). Another important feature of the reform is the provision to be made at Altona for giving young teachers a suitable scientific and professional training, instead of leaving them to private study. The net effect of these changes is expected to be very considerable.

When the policy of the Allies in utilising Dutch ships lying in their territorial waters is criticised in Holland, it is not inopportune to emphasise such facts as were revealed in the Admiralty Division of the High Court during the hearing of the salvage action concerning the *Ambon*. The plain unvarnished narrative of events show the barbarous illegalities in which the German submarines have indulged, not merely to interrupt the shipping trade with this country, but to terrorise Dutch shipping from carrying on communications with Dutch colonies. The *Ambon*, a Dutch steamer of 3,597 tons register, was about seven miles off Start Head on a voyage to the Dutch East Indies, when on February 21, 1916, she encountered a German submarine. The chief officer was sent in a lifeboat with the ship's papers and a copy of a telegram from the owners intimating that the *Ambon* was to be in Falmouth on February 21 in pursuance of an agreement between the Dutch and German Governments. The German commander refused to look at the papers, and ordered the ship's crew to the boats. "My orders admit of no variation," he said to the Dutch master. A torpedo was discharged into the *Ambon*, which did not sink, and was afterwards salvaged. By such means was it intended to hold Dutch shipping off the seas. It is well to recall these outrages now as an explanation of the idleness of the Dutch ships.

As a rule, we prefer not to discuss Labour questions which relate to the internal affairs of Trade Unionism, largely because we feel that organised workers have a right to resent interference of that character. We are bound, however, to make an exception in the case of a Society which allows its disciplinary measures to have their most serious effects—not upon the members disciplined, but upon the industry to which they belong. On the Clyde, it appears a number of "run-out" members of the Boilermakers' Society, who have been fined by the District Committee, are slow in paying their arrears of contributions. Branch secretaries are enjoined to collect the money, "as per rule," within three months, and instructed to send "these brothers" to the District Committee again in the event of failure to get it. We do not know what the war-period practice is with regard to hopelessly "run-out" members, but before the outbreak of hostilities the member who did not pay up, "as per rule," soon found himself without employment at his trade. From the point of view of Trade Unionism that is, no doubt, right and proper; but from the point of view of the average employer there is much less to be said for it. There is no obligation on employers to distinguish between unionists and non-unionists when they are engaging men, and when a Trade Union, directly or indirectly, seeks to put one upon them, it goes farther than in common fairness it ought to go. Moreover, it acts detrimentally to the interest of the industry by restricting its supply of skilled labour on very inadequate grounds, and the prospective normal supply of skilled labour is already short enough.

In order to decide whether the loss of the sailing ship *Inveramsay* fell upon the marine underwriters or on the underwriters of the war risks, the question was submitted to the Courts rather than to arbitration. An arbitrator has more latitude than a judge, and he might have apportioned the loss between the two sets of underwriters on a basis of proportionate probabilities. A judge, however, must give a cut and dried decision one way or another. No one has more clearly realised the perplexities of such a situation than have the Courts, but they are inevitable and inherent, and all that the judge can do is to draw his inference from a balance of probabilities. The last known of the *Inveramsay* is that she left Gulfport for Fleetwood on March 4, 1917, with a cargo of timber. She was never again heard of. The weather encountered by other vessels on the same route about this time was heavy. It was shown also that German submarines were active off the Irish coast, and that other timber ships had been sunk by them. It could not be established that the *Inveramsay* ever did reach the zone of submarine activity. In the absence of such evidence Mr. Justice Bailhache decided that the loss fell on the underwriters of the marine risks. All that could be proved was that the vessel had been lost at sea, and in the absence of any known circumstance on which to infer enemy action the loss must be attributed to a peril of the sea.

Some defenders of the policy of the Deputy Controller for Auxiliary Shipbuilding claim that the national shipyards project has the approval of the new Controller-General.

Fabricated Ships. That the world's biggest private shipbuilder believes in State ownership is, in our opinion, highly improbable. But there is not much doubt, we think, that Lord Pirrie appreciates the efficiency of the method of building plain cargo vessels which the national yards are to use. The question turns on what exactly the object is which it is desired to achieve. If the object is, as quickly as possible, to provide cargo-carrying capacity, "fabrication," as Americans describe the practice, is far and away superior to any other—provided the re-organisation of means and resources essential to its efficiency does not take too long, and also provided the standard, or standards, decided upon are soundly conceived and rigidly adhered to. Under no other system is it possible to get the same speed of production on a large scale. Mr. Hurley's view that through its development of the idea of fabrication America will soon lead in the world of shipbuilding raises, however, a totally different question. In our standard ships, the war's necessities rather than the shipowner's requirements, have, broadly speaking, been the deciding considerations. When the conflict comes to an end the position will be reversed, and when it is, the grounds of Mr. Hurley's optimism will disappear. Shipowners may, it is true, see their way to standardise their requirements, but, world trade being what it is, it is doubtful that they could ever do so sufficiently to make the fabrication of ships on any considerable scale a profitable enterprise.

The war has led to a remarkable expansion in the shipbuilding industry of the colonies. We have referred from time to time in this column to the extensions which have been made in existing yards, so that they may be capable of producing large ocean-going cargo steamers when previously only small coasting steamers were built, and also to the new yards which are being laid out in the different colonies. The great bar to the development of the industry in the colonies is, however, the question of steel supply. News has just come to hand that two large ships of about 5,000 tons are being laid down at Hong-Kong by the Hong-Kong and Whampoa Dock Company, and it is of interest to note that

Hong-Kong possesses a good local supply of iron ore. In Australia steps are being taken to develop the steel industry in order to produce the steel plates and sections necessary for the Commonwealth Government's shipbuilding programme. In Canada, the output of ships is restricted in consequence of the shortage of steel, but steps are being taken to remedy this, and it is announced that the Canadian Government has completed arrangements with the Dominion Iron & Steel Company, of Sydney, for the immediate construction of steel-plate rolling plant with an annual output of 150,000 tons, sufficient for the present national shipbuilding requirements. The cost of the plant will be from £600,000 to £1,000,000, and it will be in operation by the autumn.

The protection of the tail shaft is a constant source of worry to the engineer, especially where sea water is used for the lubrication of the stern tube bearings, and various means have been employed for reducing the corrosive action of the water on the steel shaft. To eliminate this trouble, it has become the practice in many cases to fit continuous liners to the shaft, extending from the outside of forward stuffing box to the propeller boss. In order to prove effective, however, the liner must be a perfect fit on the shaft, and also at the joint or gland at propeller boss, otherwise water will find its way between the shaft and liner, and set up corrosive action. These long liners are somewhat expensive, but the extra cost involved is made up for in the much longer life of the shaft, and at the same time a somewhat smaller shaft may be used. Lloyd's Register allows a reduction in shaft diameter of 5 per cent. with continuous liners. To completely cure the trouble of corrosion, the stern tube has, in a number of cases, been filled with oil, sufficient pressure being maintained in the stern tube by means of a force-pump to prevent ingress of water through the outer gland. With oil lubrication the friction in the bearings must be materially reduced as compared with water, since it is well known that the latter is anything but an efficient lubricant. If desired for cheapness, it is possible to dispense altogether with liners, although this is not always advisable. Experience has shown that lignum vitæ bushes last longer with oil lubrication, and white-metal lined bushes can also be used with advantage.

Among the many details of construction in a turbine set calling for attention is the design of the steam glands embracing the turbine spindle ends. Care should be taken with these in providing sufficient space between the turbine end and bearing for overhauling, without necessitating the lifting of turbine cover. To reduce the space required to a minimum, it is usual to arrange for the top-half of gland to be first removed, and then, by rotating the bottom-half round the shaft into its top position, it can also be easily taken away. There are, in general, two distinct types of glands in use. In reaction turbines, the labyrinth gland is most popular; with the relatively low steam pressures existing in the gland space of these turbines, experience has shown that about 20 labyrinth rings are sufficient to prevent any appreciable leakage of steam or ingress of air. With impulse turbines the steam leakage with this type of gland would become excessive owing to the high pressure in the gland space of these turbines, and it is found necessary to fit glands of the carbon segment type. The number of segmental rings depend on the pressure in the turbine shell, but is generally not less than three or four. Great care is necessary in handling of the carbon rings, owing to their brittle nature and liability to break. In the Westinghouse turbine a combination of labyrinth and water seal gland is used. The water seal operates on the principle of a centrifugal pump, producing a pressure in gland chamber, and thereby preventing leakage of steam or ingress of air.

Steam Turbine Glands.

The water seal is in operation from full to half-speed, but under this the centrifugal action of water is insufficient for sealing purposes and steam packing is then resorted to.

AMERICAN SHIPBUILDING.

"No nation can be great commercially unless it has its own manufacturing and shipping, and this is the goal which will be passed in peace if we can reach it in war. There is no doubt but that we are destined to be one of the leading shipbuilding nations of the world. We shall build ships in such large numbers and at such fair prices that we shall become the Mecca of the shipbuilding trade of the world."

THE above quotation is taken from the latest peroration (referred to more fully on page 380) of Mr. Hurley, Chairman of the American Shipping Board. It clearly shows the objective which the Board has set itself and is in keeping with the tone of the whole speech. Mr. Hurley is a man who, long before the shadow of battle spread itself over the world, cherished dreams of the supremacy of American shipping and shipbuilding, and no doubt the impetus of war has given him an opportunity to force the pace.

The total amount of steel construction in the States on March 1, he tells us, was 8,205,708 d.w. tons. The habit of conversing in terms of deadweight capacity befores comparison with previous figures, which have been rendered in gross tons, and, to a public not conversant with the difference, is apt to be misleading. We shall not be far out, however, if we hazard the equivalent gross tonnage to be 5,500,000 tons.

It has of late years been customary in America to give particulars of ships building and on order as at certain dates. This term is also abbreviated to "building," and although inaccurate it finds acceptance in official records. It may therefore be, and probably is, that in speaking of the colossal total "building," Mr. Hurley includes all ships which are definitely ordered. It is interesting, therefore, to compare this 5,500,000 tons gross with figures for the preceding 11 years.

STEEL MERCHANT VESSELS BUILDING IN THE UNITED STATES.

Building on—	No.	Gross tons.
July 1, 1907	134	403,473
" 1908	13	14,775
" 1909	65	168,848
" 1910	99	145,767
" 1911	79	100,395
" 1912	131	271,313
" 1913	134	210,429
" 1914	41	143,968
" 1915	76	310,089
" 1916	385	1,225,784
Jan. 1, 1917	403	1,495,601
Mar. 1, 1918	—	5,500,000*

* Estimated (officially, 8,205,708 tons d.w.).

In the reports that have reached this country, Mr. Hurley refers vaguely to a 28 per cent. figure (2,121,568 tons d.w.) as having been completed, but at the same time there is a reference to 8 per cent. (655,456 tons d.w.) as *actually* completed and in service on March 1. As, however, the total output for 1917 was only slightly above 900,000 tons gross, a further statement that "the programme for steel ships has advanced 28 per cent. towards completion" puts another aspect on this percentage figure. Mr. Hurley's observation that nearly as much tonnage has been constructed in American waters during the past three months as by all other maritime nations of the world depends for verification upon the latitude given the word "nearly." It is unfortunate that statements of this character betray an anxiety to overstate the case, for the American shipbuilding effort is, undeniably, one of the most potent factors in the amelioration of the tonnage shortage.

Mr. Hurley tells us that when America entered the war, she had 37 steel and 24 wooden shipyards, the number of slips being 235. Thirty new steel yards have been brought into existence, having in all 398 building slips for steel vessels. Similarly there are 81 wood building yards with 332 slips nearing completion. This makes a total of 730 berths compared with 235 on the outbreak of war.

This is stated to be 521 more slips than, according to Sir Eric Geddes, there are in the United Kingdom.

We have already pointed out that, in this speech, Mr. Hurley appeared to be making out the strongest possible case he could for the American Shipping Board. He talks of the 50 slipways at the fabricating yard at Hog Island. This yard is the subject of strong comment in American shipbuilding circles and its workings are being investigated by the authorities there. Something like £4,700,000 had been spent on it up to January 31 last, and, according to a report submitted to the Senate shipyard committee the keel of the first ship had then been laid and 12 ways partially completed.

It is obvious, however, that the speech is not all the "hot air" ascribed to it in some quarters and that America is running a neck and neck race with this country. Anyone who reads Mr. Hurley's speech carefully will see that organised labour has not always assisted. The incident of the Hog Island plant, which we have just cited, demonstrates the obstacles that have been encountered in another direction. But in spite of all these hindrances the output figures are steadily progressive. The American output during March was 36 ships of 272,786 tons launched (the Reuter message of March 30 does not say whether gross or deadweight) and 20 vessels of 162,200 tons delivered. Much has been said about making shipyard workers keener in this country through the competition of districts. We think that if it were put to the men that America, which in no pre-war year managed to build more than 620,000 tons gross, is likely to outstrip the United Kingdom, an even greater stimulus would be given to their efforts. The economic significance to this country of America's awakening is too obvious to need argument.

LABOUR'S AGGRESSIVE MINORITY.

TRADE Unionism's great misfortune is, and has always been, that its minority of extremists are facile writers and speakers, and its majority of reasonable men lovers of a quiet life. The reasonable men are not, of course, without grievances, and occasionally they leave employers and the world generally in no doubt about their resentment. Of these grievances, the extremists, being handy with their tongues and their pens, naturally make as much as possible; but it is as cultivators of new grievances that they do most effective work—when the conditions are, as at present—favourable.

The periodical literature of the movement gives dire prominence to their propaganda. It is not, however, the only medium used by them. They find a difficulty in reaching the rank and file of Trade Unionism who, instead of reading the organs of extreme opinion, confine themselves to the official publications of their societies. But they are resourceful men, these propagandists, and one or two of them are overcoming this difficulty by standing for every office, even though their chances of election are remote. As candidates, they are entitled to have election addresses printed and circulated by their Trade Union, and naturally they make the most of their privilege.

Here, for instance, is how a candidate for a minor office in the Amalgamated Society of Engineers supports his claim to election:—

"The antagonism (expressed by associating with our fellows in Trade Unions) between the wage-earner on the one hand and the masters of land and wealth-producing activities of all kinds on the other, cannot be dispelled on the call of these masters if and when their Imperialistic aims miscarry, even though supported by indulged labour representatives. Trade Unionists of 'enemy' countries may, and do, have interests in common, but with the employing class in their respective countries—never."

The position to which the candidate aspires is, it may be explained, that of an Assistant Secretary "under the control of the Executive Council." But he is obviously much more concerned about "the advent of the Workers' Republic," in which, of course, industry would be controlled by the workers.

"The medium of the shop stewards' movement in its most recently developed aspect contains within itself," he says, "a force which, in conjunction with the capture of political power, may well bring about realisation" of the control of industry, "and incidentally relieve the Capitalist bagmen of their quest for markets, in the process of which continents are drenched with the blood of the workers in their murderous scientific warfare."

Another candidate for the same office says:—

"Industry must be socialised. The experience of the war period proves that mere State control is of little use. There must be real democratic control of the State and of industry."

Another claims that the war:—

"Has proved the total failure of a self-appointed Capitalist Government to fight for Democracy by taking away from the workers every vestige of liberty they may have once possessed. They cannot feed the people because they believe in control instead of ownership. A State cannot control that which is privately owned; it can only administer that which is nationally owned. We have been told this is an engineers' war. Let us, therefore, see to it that the engineers, with all other workers, have a share in the making of peace terms, and not accept a burden of debt caused by the investment of surplus wealth in War Loans."

As we have suggested, these views are shared by only a minority of Trade Unionists, and are expressed in this particular form merely with the object of "spreading the light." The candidates do not expect to be elected, and in fact rarely are elected. Many engineers resent the use of their organisation for revolutionary propaganda.

"I am an old member," writes one, "and my membership runs into double figures, and I joined a Trade Union—not a band of Anarchists . . . If anyone wants to preach revolution, let him try his hand on the Germans. I will gladly get my hand down to help pay his passage money so that he may try his eloquence on his friends."

But although the extremists are only a minority they are, as we have shown, an active minority. They talk and they write, and they vote. Possibly, it is because they invariably poll their full strength, while the majority show themselves to be poor voters, that Executive Councils do not in times of crisis repudiate them and their inconvenient views. Sooner or later, however, both extremists and extreme views will have to be appropriately dealt with, for Executive Councils cannot go into joint conferences with employers on post-war conditions with a section of their rank and file clamouring in official publications for the extermination of Capitalists. There is much less wrong with the relations of Capital and Labour than the extremists wish the world to believe, and Executive Councils are greatly to blame for not making the fact plainer.

CARGO SHIPS.

THE existing literature on the subject of cargo ships has had valuable addition made to it in the important papers read during the Naval Architects' meetings. Justification for the adoption of standard designs was given by Sir George Carter, who pointed out the advantages to be gained thereby when a large number of vessels of definite capabilities were required. One of the points mentioned by Sir George is worthy of note, viz., the reduction in number of sections required in the construction of a ship, from 8 to 10 only being needed against 30 to 40 used in pre-war days for the same type of ship. Now, it appears to the writer of this article, that this is the crux of the whole situation with regard to this vexed question of standard ships. Had an individual owner gone to a number of shipbuilders and requested the construction of a large number of cargo ships of definite size and capabilities, there is no doubt but that these builders would have been only too pleased to agree to his demands for uniformity of design, especially if the price was good. When, however, an owner has also control

of the steel works, it is certainly to the advantage of quick production to see that the number of sections required for the construction of ships should be reduced to a minimum. The Government had to consider this feature, and accord it first place, since their requirements were in excess of the normal output from the steel works. Had a private owner had the same difficulty the greatest attention would have been given by shipbuilders to meet his demands, but when the Government are the owners a different atmosphere seems to be created. This is due partly to the idea that the builders know better than Government officials do, and also to these officials being unable to properly gauge the spirit of the builders. Certain owners know their particular builders well enough to give them a fairly free hand in the work being done for them and in such places the best of work and the maximum of production is secured, but where a body of officious overseers are constantly making their presence felt the work suffers accordingly.

The number of types of standard ships was referred to, and sketches given of the arrangement of these ships, as also were particulars of their dimensions, &c. From these we gather that the designs have been well thought out. A good ratio of deadweight to displacement is obtained, and due regard has been given to the effect of fulness on the sea speeds of ships. Thus the largest of the types has a block coefficient of only .762, which coefficient should enable a good sea speed to be maintained with the power installed. The case for the standard ship did not suffer any in the concise and clear paper given by Sir George.

A most important subject was treated by Mr. Anderson when he discussed "The Most Suitable Sizes and Speeds for General Cargo Steamers." The problem set in the paper was to find the dimensions which would give the best compromise between the advantages accruing from building large cargo ships in giving (1) reduced initial cost in relation to the deadweight, (2) in giving reduced horsepower, crew, and amount of coal in relation to the deadweight, and contrasting these with the disadvantage ensuing from the increased length of time required to load and discharge a large ship as compared with one smaller. From the investigations made and the results obtained it appears that the most suitable length of a tramp trader is from 380 to 400 ft., with a speed of from 9 to 9½ knots. The maximum efficiency is given by large ships, but the draught required is such that the existing depths of harbours prohibits their general use.

In view of keen commercial competition with other maritime powers after the war, Mr. W. S. Abell did well to call attention to the need for further research in all branches of shipbuilding and engineering. Like Mr. A. T. Wall, Mr. Abell considers that the necessity of making experiments on a very large scale is imperative. Questions regarding frictional resistance, sea speeds, resistance of appendages, and screw propellers, all call for further study. In connection with matters directly affecting cargo ships Mr. Abell made the striking statement that the great majority of vessels spend about half their existence in port. During that time the vessel is unproductive, i.e., it is eating up charges and is not earning freights. Even in long voyages from this country to the most distant parts it is not uncommon to find that only 60 per cent. of the time is passed at sea. It is essential, therefore, and this was urged on by Mr. Anderson in his paper also, that every method which will reduce this loss of time in port should be carefully studied. In ships themselves broad and shallow holds are much more easily worked than deep and narrow ones, and this point should be considered as well as the discharging appliances.

The advantages and objections to the use of concrete in shipbuilding were discussed in the papers given by Major Denny and Mr. Pollock. To two points contained therein attention is drawn. Major Denny, as also did Mr. Pollock, referred to the necessity for the minimum amount of curvature being adopted and a departure being made from the usual shipshape form. The minimum amount of shaping will be given by a rectangular box, but as such a form is

inadmissible a compromise must be effected. "Straight frame" forms are the best solution to the problem, and it is along these lines that the latest "N" type standard ship, referred to by Sir Eric Geddes the other day in the House, is designed. Thus the type of form which best suits the steel "fabricated ship" is also that which lends itself most easily to concrete building. Both of these papers showed that the practicability of concrete ships was undoubted, but that their chance of successful competition with steel ships in normal times was questionable. This is made evident in the figures of light weight and deadweight given in these communications. Major Denny showed that with identical dimensions on a length of 375 ft. and a displacement of 9,900 tons the concrete ship would carry 1,180 tons less than the steel vessel would. Mr. Pollock put the same proposition in a different form, but equally striking. In a small coasting vessel to carry 300 tons, 290 tons of material would be required for the hull of a reinforced concrete ship, whilst only 120 tons would be needed for a steel vessel. This increased weight of vessel to carry the same amount of cargo would mean a constant drag on the concrete ship as compared with that of steel due to (1) heavier coal bill for the same actual speed, and (2) increase of net tonnage and consequent increase in port and harbour dues. Against these main objections it is claimed that money would be saved in the construction of concrete ships and that the initial cost and upkeep charges would be so much less that the greater cost of fuel and port dues for the concrete ship would probably be balanced.

As a war measure there is sufficient justification for the construction of concrete ships, but their adaptability and serviceability will require to be clearly demonstrated to shipowners before their use becomes general.

These papers above referred to have each a flavour of practical utility which should cause them to be carefully studied by all those engaged in the design and construction of cargo ships. Many of the contributions to the transactions of the I.N.A. are too technical to be attractive to many, but in this session the bulk of the papers have been of a practical nature well suited to the requirements of the peculiar times.

TRADE PUBLICATIONS.

[Copies of any of the publications mentioned in this section will be sent on application to the firms by which they are issued.]

On the Merit of Triplex.—We have received an interesting little booklet which forms a reprint from our contemporary, setting forth the merits of "Triplex" safety glass. Briefly, Triplex consists of two pieces of glass between which is introduced a sheet of transparent xylonite. Adhesion of the layers under very high pressure with transparent xylonite renders Triplex undistinguishable from ordinary plate glass. It differs in this respect, however, that it is practically unbreakable, and consequently, if cracked, or shattered by a blow, no particles become detached and nobody can be injured by flying pieces of glass, and it still remains air and water tight. This renders it particularly suitable for portholes, windows, goggles, chart tables, windscreens, ship's bridge screens, &c. For the heaviest class of service the glass is made in 5-ply, 7-ply, or 8-ply, the thicknesses ranging from $\frac{3}{32}$ in. up to 3 in., and photographs in the book show the extent to which the glass can be damaged without breaking.

A very interesting and conclusive proof of the value of Triplex safety glass is provided by an aeroplane windscreen just returned to the makers for repairs. It had been fitted to a school machine which crashed to earth from a height of 15,000 ft. The screw end of the screen was buried in the earth and had to be dug out, but beyond some surface cracks, the glass itself was quite complete and unbroken.

The offices of the Triplex Safety Glass Company, Ltd., are at 1, Albemarle Street, London, W.1.

Thornycroft Kerosene Vaporiser.—In view of the restrictions on the use of petrol, anything which tends to lead to the adoption of petrol engines to the use of any other and cheaper kind of fuel

is of interest, and there are many owners of small motor craft who will welcome the appearance of an efficient vaporiser which enables the petrol engine to run easily and efficiently on kerosene, i.e., paraffin. J. I. Thornycroft & Co., Ltd., whose head office is at Caxton House, Westminster, London, S.W.1, have been experimenting for 12 years in the production of a device for enabling motor engines to run successfully on paraffin, and the vaporiser described in this booklet is the result of their experiment. In addition to an illustrated description of the vaporiser, some useful hints are given on the starting, running, and stopping of a petrol engine fitted with the device, including starting the engines on occasions when even a small quantity of petrol is not available.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by Correspondents.]

LORD INCHCAPE AND THE CHEPSTOW SHIPYARD.

4, Seamore Place, Mayfair, April 1, 1918.

TO THE EDITOR OF SHIPBUILDING AND SHIPPING RECORD.

Towards the end of 1915 a proposal was made to some of my friends and myself to start a shipbuilding yard on up-to-date lines at Chepstow on the Wye. We appreciated the soundness of the proposition. The necessary capital of £600,000 was put up, the requisite land with foreshore rights on both sides of the river was purchased, and operations were started to lay out the yard on the most approved principles—eight slips capable of accommodating vessels of 500 ft. to 600 ft. in length being arranged for.

The work was proceeding with expedition. Two slips would have been ready by October, 1917, and on these two slips vessels with a carrying capacity of 10,000 tons each would have been laid down and would by this time have been well on their way to the water. Other two slips would have been ready now, other two by July, and the other two by October.

In August, 1917, however, the Government apparently recognising the advantages of Chepstow as a building centre, which we had discovered, took over our yard and we were unceremoniously evicted. So far not a single ship has been laid down, and there is very little more, if any, plant or machinery on the place than there was when we were turned out.

All the work and thought and time spent in negotiation, in forming the company, in securing the land, in purchasing buildings and small plots, in arranging regarding rights of way, in securing a railway siding, in planning and erecting workmen's houses on the plan of a Garden City, in planning the yard and all its accessories, in settling with owners of fishing rights on the Wye who thought shipbuilding might prejudice salmon catching, have gone by the board and the bulk of the capital laid out, so far as we are concerned, is dead, Government not having repaid it or even paid interest on our outlay. We have, indeed, not been told whether they intend to keep the yard permanently or not. We can get no answer out of them either one way or the other, and we are now engaged in the notoriously expensive and protracted operation of endeavouring to obtain justice by means of the process known as a "Petition of Right." I think a better name for it would be a "Petition against Wrong."

Ours was no promoting project. Not a penny passed by way of promotion money, underwriting commission or anything else. We cast our £600,000 on the waters, trusting to see a return after many days. At the same time, if I may venture to say so, we were actuated by patriotic motives, and were anxious to do our bit to help to save our country. But as we are business people this suggestion in some quarters will be probably scouted. In the quarters to which I refer it is generally assumed that patriotism has no existence except in a Government office, and that it can only flourish if carefully wrapped up in red tape.

The position was this:—A group of business men, with a chairman of exceptional business capacity at their head and a practical engineer and shipbuilder with great energy and organising power

as managing director, foresaw a serious shortage of tonnage in the near future. They realised that Chepstow might be made a ship-building centre with vast potentialities. It had a splendid river into which vessels could be safely launched, close proximity to steel works and coal, excellent foundation for slipways, the Great Western main line passing the yard, a good climate, a nucleus of labour, which could be added to by training, a lovely country around, and by providing comfortable and attractive houses, each with a garden, the welfare of the workmen, away from demoralising slums, could be assured.

If the seizure of our ideas and our yard had proved of any advantage to the country we should have acquiesced in it without a murmur, but as the country's interests would have been infinitely better served had we been left alone to carry out our project in our own way, it is only natural that we should feel somewhat sore that the foresight and enterprise which we displayed should have been squandered as it has been, and that our property and perspicuity should have been filched from us without up to this time having been of the slightest use to the nation.

Mr. Asquith is reported to have said at Derby on March 22:—

"Our experience of State control has not been encouraging. To think that you can maintain your industrial supremacy in times of peace against the competition of the civilised world is the idlest, emptiest and most futile idea."

Mr. Asquith prefaced his remarks by saying that he thought every business man in the country, whether employer or employed, would agree with him.

In saying what he did, Mr. Asquith voiced the views of the entire business community, and, I believe, of the employed as well.

INCHCAPE.

SAILING SHIPS—LIMITATION RATES, U.K.—FRANCE.

28, St. Mary Axe, London, E.C.3,

March 27, 1918.

TO THE EDITOR OF SHIPBUILDING AND SHIPPING RECORD.

The Chamber has been approached by one of its members in regard to the limitation rate of freight laid down by the Ministry of Shipping with regard to the United Kingdom-French trade. Owners of sailing ships have submitted to this Chamber that, having regard to the heavy cost of war insurance, the cost of which is left with owners, the rates laid down for sailing ships are inadequate.

A meeting of owners, or representatives of owners, of sailing ships concerned, will be held in the Council Chamber, at 24, St. Mary Axe, E.C., on Thursday, April 18, at 2.30 p.m. Mr. R. Mason, of Newcastle-on-Tyne, one of the Shipowner Members of the Central Executive Committee of Great Britain for the supply of coal to France and Italy, who has specially interested himself in the question, will be good enough to take the chair, if possible.

I am desired to ask both societies and clubs to advise any of their sailing ship members likely to be interested.

H. J. SPRATT,
Acting Secretary.

THE COAL CONTROLLER AND BROKERAGE.—Sir Clifford J. Cory presided over a meeting recently of representative coal exporters of London, Cardiff, Swansea, and other ports to consider the recent action of the Coal Controller in regard to the one-third of 5 per cent. brokerage, which he had instructed the exporters to hand over to the colliery proprietors. It was decided to appoint a joint committee of representatives of the various districts to take such further proceedings as may be considered necessary to protect the rights and interests of coal exporters, and it was recommended that no brokerage be paid except under protest and reservation of right of recovery. Mr. W. R. Hawkins, secretary of the Cardiff Chamber of Commerce, was appointed secretary of the committee.

THE EFFECTS OF EXPLOSIONS OF MINES AND TORPEDOES ON MERCHANT SHIPS.

It will be recalled that in the annual report of the Council of the Institution of Naval Architects, presented at the opening meeting a fortnight ago, reference was made to the recommendations of the Committee which had been appointed by the Council to report upon the effects of the explosions of mines and torpedoes on the structure of merchant ships. The Committee was under the chairmanship of Mr. S. W. Barnaby, and included Professor T. B. Abell, Professor Sir John H. Biles, Admiral Sir H. B. Jackson, A. E. Seaton, Esq., Professor J. J. Welch and W. H. Whiting, Esq. Its report, which is dated May 8, 1917, has been submitted to the Admiralty, the Board of Trade and the Shipping Controller, although it is only now made public, but it may be recalled that Mr. Barnaby, in the course of the discussion on Sir George Carter's paper on "Standard Cargo Ships," announced that the recommendations of the Committee had for the most part been adopted in the designs of the standard ships.

The report of the Committee is divided into two parts, the first dealing with cargo ships, and the second with passenger vessels, and contains suggestions for certain temporary war expedients which might be adopted at very little expense in the ordinary type of cargo vessel, and which they are of opinion would have the effect of greatly increasing their chances of safety after being mined or torpedoed, provided that only one main compartment is opened up to the sea.

I.—CARGO SHIPS.

The Committee, having examined the information placed at their disposal by the Admiralty and the Board of Trade, are of opinion that the loss of many of these vessels has been due to three causes: (a) the existence of watertight doors low down in the bulkheads which could not be closed after the explosion; (b) fractures of suction pipes in the attacked compartment permitting water to flow into adjacent compartments; (c) the penetration of bulkheads adjacent to the attacked compartments by fragments of plating, frames, rivets, &c.

A large number of cargo vessels have four main holds and six bulkheads, arranged as follows:—

- No. 1. Collision bulkhead.
- No. 2. Between Nos. 1 and 2 holds.
- No. 3. At fore end of boiler-room.
- No. 4. At aft end of engine-room.
- No. 5. Between Nos. 3 and 4 holds.
- No. 6. At after peak.

With fewer bulkheads than this the chances of keeping a vessel afloat are very much reduced.

Taking this six-bulkhead arrangement as a typical case, the recommendations of the Committee, as applied to cargo ships with six or more bulkheads, are as follows:—

1. All existing watertight doors low down in main bulkheads should be closed up and so secured that they cannot be opened. If watertight doors are necessary, they should be fitted high up in the bulkhead. This is particularly important when bunker coal is carried forward of the boiler-room bulkhead, as a watertight door through which coal is being trimmed cannot be depended upon.

2. The watertight door to the shaft tunnel in the engine-room bulkhead should be closed up and so secured that it cannot be opened, access to the tunnel being provided by means of a watertight trunk carried up to the bulkhead deck. Cases have occurred when the engine-room has been flooded too quickly to permit of the tunnel door being closed, with the result that considerable quantities of water have entered the after-holds through the tunnel, which was not sufficiently watertight. An explosion in one of the after-holds would be likely to injure the tunnel, resulting in the flooding of the engine-room and boiler-room, unless the tunnel door is closed as proposed.

3. The tunnel, or any other longitudinal passage below the water-line, should be thoroughly watertight.

4. Each suction pipe, where it enters the compartment from which

it drains, should be provided with a screw-down non-return or other suitable valve, which can be worked from the bulkhead deck. These valves should be kept closed at all times, except when the pumps are in use.

5. The amount of injury which the bulkheads might receive from flying fragments will depend greatly on the nature and amount of cargo in the hold. If the hold is well filled the risk of injury is much less than when partly filled or empty. If the cargo is of a heavy nature the upper parts of the bulkheads will probably be exposed. It is recommended that, wherever possible, the bulkheads should be protected temporarily by means of timber or other suitable material, forming a splinter screen. In some cases the cargo itself could be utilized for this purpose. The necessity for some protection of this sort is particularly great in the case of ships in ballast.

Very little time and money would be expended in giving these measures of protection to a large number of cargo vessels.

II.—EXISTING LARGE MAIL AND PASSENGER VESSELS.

These vessels, having more numerous bulkheads in proportion to their length than the ordinary cargo steamer already reported on, should be better able to withstand attack from mine or torpedo.

On the other hand, many mail and passenger steamers have watertight doors in the 'tween decks giving communication through the watertight bulkheads between passenger and other spaces. They have also side scuttles, for ventilating cabins, and numerous sanitary discharges very near the water-line. These are liable to be submerged and to admit water, should the scuttles be open or the controlling valves to the baths, water-closets, &c., be inefficient. This liability will be greater in the case of vessels having small initial stability or possessing longitudinal bulkheads, if damage occurs in way of such bulkheads. In some vessels also there are passages leading through bulkheads in the ship's hold to allow the firemen and greasers to gain their quarters without traversing any of the passenger decks. All these features have proved to be sources of danger.

Further, the hatchways in such vessels are relatively small and do not afford such instantaneous relief from air and gas pressure resulting from an explosion as in the case of the larger hatchways of cargo vessels. For this reason it is considered that bulkheads in the neighbourhood of the explosion are more liable to distortion in mail and passenger vessels than in cargo ships and that watertight doors on such bulkheads cannot be relied upon to close after an explosion. Devices for closing doors from the bridge are likely to fail, both by reason of the above-mentioned distortion and because of the probable destruction of the hydraulic or electric mains provided for the purpose in the region of the explosion.

In view of the foregoing it is suggested that the following measures be adopted in existing vessels during the continuance of the war:—

1. The disuse of all firemen's passages and the closing up of all doorways in bulkheads traversed by them when below the bulkhead deck, the firemen passing to and from their quarters by way of an upper deck, where a temporary screened passage could be provided if necessary.

2. All openings from the engine-room into shaft tunnels to be abolished and access to tunnels provided through trunks abaft the engine-room bulkhead: these trunks to be watertight to the bulkhead deck.

3. All watertight doors in transverse bulkheads throughout the machinery spaces to be closed and so secured that they cannot be opened, provision being made for efficient supervision in each separate compartment. If this is deemed impracticable in certain cases, it is recommended that in such cases the doors on the level of the stokehold and engine-room floors should be closed and others fitted as high up as possible on these bulkheads.

4. All watertight doors in transverse bulkheads on decks below the bulkhead deck to be closed and so secured that they cannot be opened, additional exits to the decks above being provided where necessary.

5. All side scuttles situated below the first deck above the bulkhead deck should be closed up and sealed. Special fan ventilation is to be provided if necessary for the cabins affected.

6. Each suction pipe where it enters the compartment from which it drains should be provided with a screw-down non-return or other suitable valve which can be worked from the bulkhead deck. These valves are to be kept closed except when the pumps are in use.

7. Where ventilation trunks, &c., pass through watertight bulkheads below the bulkhead deck, valves operated from above that deck should, in all cases, be fitted at the bulkheads, and if any trunk pierces the bulkhead at a low level it is strongly recommended that a new lead should be devised to carry it through the bulkhead at as high a level as possible.

8. Valves on all sanitary discharges at the ship's side should be such as will prevent water passing inboard through them when the vessel has considerable trim or list. These valves should be frequently examined and kept in good order.

9. Any ash or rubbish shoots, &c., having upper ends opening on decks below the bulkhead deck should be provided with watertight covers, and instructions should be issued to ensure that these covers are always in place when the shoots are not in use.

THE AMERICAN SHIPBUILDING EFFORT. OVER 8,000,000 TONS DEADWEIGHT UNDER CONSTRUCTION.

The following abstracts are from a speech recently delivered by Mr. Hurley, chairman of the American Shipping Board. We comment upon the speech on page 376:—

"There were 37 steel shipyards in America at the time of our entrance into the war. We have located 81 additional steel and wood yards, while 18 others have been expanded. We are building in the new and expanded steel yards 235 new steel shipways, or 26 more than at present exist in all the steel shipyards of England. The total amount of our steel construction on March 1 was 8,205,708 tons d.w. This was made up of 5,160,300 tons d.w. under contract with the Emergency Fleet Corporation, and 304,508 tons d.w. of requisition vessels. Of this total steel construction 2,121,568 tons d.w., or approximately 28 per cent., have been completed. The programme for steel ships has advanced 28 per cent. towards completion. Of the amount of steel ships under contract and requisition 655,456 tons d.w., or approximately 8 per cent., were actually completed and in service on March 1 this year. Nearly as much tonnage has been constructed in American waters during the past three months as by all other maritime nations of the world combined. And we have also placed in ours and the Allies' war service 112 first-class German and Austrian vessels, representing a carrying capacity of nearly 800,000 tons d.w.

Thirty additional new steel shipyards are being erected, with a total of 203 shipbuilding ways. Thus we now have in the aggregate 67 steel shipyards either wholly or partly engaged in Fleet Corporation work. These yards will have a total of 398 steel building ways.

A year ago we found 24 old wooden shipyards with 73 shipways. Now we have 81 wooden shipbuilding yards with 332 ways completed or nearing completion. We should turn out about 2,300,000 tons d.w. of wooden ships annually. These 332 wooden shipbuilding ways now nearing completion, added to our 398 steel shipbuilding ways, give us a total of 730 berths upon which to build steel and wooden vessels."

Mr. Hurley referred to the difficulty of maintaining a proportionate output of machinery. He then went on to speak of labour difficulties, instancing "restriction of output" as one of the troubles. The additional cost of their ships due to increased wages would be, he said, over £60,000,000. They were endeavouring to create a reserve of 250,000 skilled workmen by the establishment of schools. In 1916 there were less than 45,000 men employed in all the shipyards of the country, and on March 2 last this had been increased to 236,000

of which 170,589 were working on hull construction. The three fabricating yards were at Hog Island, Newark Bay and Bristol (Pennsylvania). They were assembling yards with 50 ways at Hog Island, 28 at Newark Bay, and 12 at Bristol. They would, he said, when in full operation, "produce in a single year more ships than England, the greatest maritime nation in the world, has ever been able to turn out in the same length of time."

STANDARD RATES OF PAY FOR ENGINEER OFFICERS.

On March 21 the Shipping Controller announced the standard rates of pay for engineer officers on cargo liners and general trading vessels. At a meeting of the Engineer Officers' Panel of the National Maritime Board, on March 26, under the presidency of Sir Leo Chiozza Money, M.P., the following scale for engineer officers serving on general trading vessels at weekly rates of pay and finding their own food was agreed to by the Board and has been confirmed by the Shipping Controller:—

GROSS Tonnage.	FIRST ENGINEER.						Uncertificated.			
	Certificated.									
	Begin at.	After one year.	After two years.	After three years.	After five years.	After six years.	Begin at.	After one year.	After two years.	After three years.
1,001 and over ..	£ 7½	£ 7	£ 7½	£ 7½	£ 8	£ 8	£ 6½	£ 6	£ 6½	£ 6½
501 to 1,000 ..	7	7	7½	7	7½	*	6	6½	6½	6½
201 to 500 ..	6½	6	6½	6½	7	*	5½	5½	6	6½

* Further increases (if any) at owners' discretion.

GROSS Tonnage.	SECOND ENGINEER.				Uncertificated.			
	Certificated.							
	Begin at.	After one year.	After two years.	After three years.	Begin at.	After one year.	After two years.	After three years.
1,001 and over ..	£ 6	£ 6½	£ 6½	£ 7	£ 5½	£ 5½	£ 6	£ 6½
501 to 1,000 ..	6½	6	6½	6½	5½	5½	6	6
201 to 500 ..	5	5	5½	6	5½	5½	5	5½

Where food is found by the owners, the appropriate rate should be obtained by deducting from the above rates 25s. weekly or *pro rata* for part of a week.

These rates do not apply to the cases of oil tank steamers, motor vessels, salvage and cable steamers, railway steamers and other exceptional matters which have yet to be considered by the Board.

An officer's pay under the new scale will be determined as regards service by the period he has held his present post in the same employment as at March 26, 1918.

An officer will be entitled to back pay at the same rate for any period of service on articles or continuous employment with the same owners, irrespective of articles, from October 6, 1917, or from the date of commencing pay if subsequent thereto.

Increments will date from the anniversary of the date of taking up present post in the same employment.

An agreement has also been reached regarding payment for overtime worked by engineers in home and foreign ports.

CARDIFF MARITIME BOARD.—Maritime Boards have now been formed for the purpose of settling disputes and difficulties which may arise between sailors and firemen and the shipowners. A meeting of the Board was held recently, when Mr. H. Griffin and Mr. F. W. de Gruchy, from the Ministry of Shipping, were present. The chairman (Mr. H. Griffin) explained the object of the establishment of the Boards, and appealed to both sides to avoid the causes of past irritation. Mr. T. W. Lewis, the stipendiary magistrate, was appointed chairman of the Board. The shipowners were represented by J. T. Duncan, Dan Radcliffe, John Cory, W. W. Jones and F. Jones; and J. Henson, M. Tearle and J. Marsden represented the seamen.

APPLICATION OF ELECTRICITY TO VARIOUS AUXILIARIES ON SHIPBOARD.*

For the past several years the attention of the Society has been invited at intervals to the application of electricity in various forms to vessels in both the naval and merchant service. Developments have recently been such that the time seems opportune for the consideration of the general application of electricity to merchant vessels, not only as to the possible advantages gained in their propulsion, but particularly also to the operation of their auxiliaries, in the light of results already attained and installations contracted for.

The marine engineer and the seafaring man in general are naturally conservative in the adoption of new and untried apparatus. The time is rapidly approaching, however, if not already here, when the results obtained will justify the construction generally of vessels electrically equipped in all or many of their power applications. It is here interesting to note that in the use of electricity the American Navy has not only been far in advance of the merchant marine, but, we believe, has led all navies of the world. Europe, however, seems to have led this country in the trial of electrical apparatus for auxiliaries on merchant vessels.

Two or three years ago the *Christian X* created much interest on its first voyage here with its oil propelling engines and electrically operated auxiliaries. Similarly, last winter, the *Chile*, constructed by Burmeister & Wain, was visited while in New York harbour by many marine and electrical engineers. This vessel, of 13,400 tons displacement, and provided with oil engines of a total h.p. of over 3,000, was equipped throughout with electrically operated auxiliaries, both for engine-room and deck machinery. Three Diesel engine-driven 60-kw. generators furnished direct-current to the auxiliaries at 220 volts. We understand, however, that one of these generating sets was sufficient to supply auxiliary power while at sea, and two were used while handling cargo in port. At least one generating set was, therefore, always available as spare.

In the engine-room equipment were included motor-operated ventilation fans, motor-driven centrifugal circulating water pumps, bilge and sanitary pumps, ballast pumps, engine-turning motor, motor for operating tools in repair shop, &c. In the deck equipment, electrically operated steering gear, deck winches and anchor windlass were provided.

In this connection we would draw attention to the influence which the growing use of oil-operated engines has on the adoption of electricity for ship auxiliaries.

Among the most striking examples of the use of electricity on merchant vessels are the boats being constructed and projected by the Pennsylvania Shipbuilding Company at Gloucester City, New Jersey. This company has under construction six tank steamers of about 7,500 tons displacement, one of which is nearly completed and another will take the water shortly, which will be propelled by geared steam turbines and their auxiliaries operated by electricity throughout. The electrical equipment on each of these vessels will consist of the following:—

- 1 12-kw. 3-phase, 60-volt, 22-watt steam turbine generator.
- 1 anchor windlass, 25-h.p. slip-ring type motor.
- 1 deck draught fan, 25-h.p. slip-ring type motor.
- 1 steering gear equipment, 15-h.p. squirrel cage type motor.
- 2 large 60-h.p. 220-volt squirrel cage type motors.
- 2 deck winches, 15-h.p. squirrel cage type motors.
- 1 warping winch, 15-h.p. squirrel cage type motor.
- 1 oil transfer pump, 5-h.p. squirrel cage type motor.
- 1 forward bilge pump, 5-h.p. squirrel cage type motor.
- 1 bilge pump for pump room, 5-h.p. squirrel cage type motor.
- 1 circulating water pump, 5-h.p. squirrel cage type motor.
- 1 workshop motor, 5-h.p. squirrel cage type motor.
- 1 refrigerating plant, 5-h.p. squirrel cage type motor.
- 1 oil tank ventilation blower, 5-h.p. squirrel cage type motor.
- 1 fresh water pump, 5-h.p. squirrel cage type motor.

In addition to the above tankers, two cargo vessels of 12,000 tons

* Abstract of Paper read at twenty-first general meeting of the Society of Naval Architects and Marine Engineers, New York, on November 15-16, 1917, by H. L. Hibbard.

displacement will soon be laid down, and which will have an equipment of auxiliary motors similar to the above tank vessels with the exception of the deck winches, which will consist of three of 25 h.p. and eight of 15 h.p. It is further contemplated that these two cargo vessels will be electrically propelled and operated by two turbo generating sets, each set furnishing current to a 1,500-h.p. motor, the two motors being geared to the single propeller shaft. In addition to these vessels, this company contemplates the construction also of six cargo boats propelled by geared steam turbines and with electrical auxiliaries similar to the above.

For the above vessels open-type alternating-current motors will be provided throughout and watertight enclosing cases furnished for the deck motors, with the particular view to protecting them from exposure to moisture; but the cases can be removed, if desired, when the vessels are in port, to give the motors ample ventilation. The majority of the motors will be operated from a common switchboard in the generator room, and in most cases no means is provided for starting or stopping the motors at the auxiliary. A particular exception is the case of the anchor windlass having its controller near the motor on deck.

It will be noted that alternating current has been employed throughout on the above vessels, and those advocating the same point to the necessity, in the case of the tank vessels, of using the alternating-current squirrel cage type motor with its freedom from moving contacts in places exposed to the possible presence of oil vapour. With the same object, the controlling devices, as described above, are all centralised in the generator room. On these vessels also an interesting form of deck winch is used for the first time, employing a constant running motor and a set of planetary gears so arranged that, by the operation of a lever and two brake bands, the load can be stopped or the speed of the winch varied while the motor continues to operate at constant speed.

In contrast to the alternating current used on the above vessels, the Texas Oil Company is soon to construct a tank vessel of approximately 6,000 tons displacement, propelled by fuel oil engines and provided with direct-current 230-volt motors on its auxiliaries. The principal auxiliary equipments on this vessel will be as follows, although a few additional will probably be eventually supplied:—

- 6 1-h.p. variable speed cargo pump motors, enclosed type, variable speed.
- 1 20-h.p. fire-room bilge pump motor, enclosed type, constant speed.
- 4 1-h.p. constant speed, enclosed type motors for operating auxiliary pumps.
- 2 refrigerating machines, 3-h.p. enclosed type motors, variable speed.
- 1 10-h.p. steering gear motor, open type, constant speed.
- 2 cargo deck winches, 20-h.p. enclosed type, compound wound.
- 1 20-h.p. capstan, open type compound wound.
- 1 25-h.p. windlass, enclosed type, compound wound.

The six cargo pump motors and the bilge pump motor, all we understand located in the same compartment, will be operated from controllers on a common switchboard in the generating room, similar to the arrangement for the Pennsylvania Shipbuilding Company's tankers. In addition, however, watertight push-button stations will be located adjacent to the motors, which will stop the pumps when desired, to be again started from the generator room. The cargo pump motors and the motors exposed on deck will probably be provided with enclosing cases, furnished with forced ventilation, or this forced ventilation carried directly into the enclosed motor frames.

While it is not here the intention to discuss in detail the relative merits of various kinds of motors, it may be mentioned that in comparing the direct-current with the alternating-current equipments mentioned above, a saving in wiring, flexibility of speed control, and improved steel and torque characteristics for the deck auxiliaries are on the side of the direct-current equipments. The alternating-current motor, as pointed out above, has the advantage of freedom from moving contacts and the reduction, in consequence, to a minimum of the possibility of sparks in places where inflammable gases might be encountered, as in the case of the tank steamers. This, however, applies particularly to the constant speed, squirrel-cage type of alternating-current motor, the slip-ring type of motor which is required for some applications being provided with moving contacts.

In connection with the electric propulsion of ships, it is interesting to note that this mode of propulsion is receiving considerable attention in its application to merchant vessels. In addition to the two cargo vessels of the Pennsylvania Shipbuilding Company's plant, which it is expected to propel electrically, we are familiar with electrical installations on four oil barges under construction at New Orleans by the Petroleum Transport Company. These boats are twin screw, each propeller being driven by a 300-h.p., 480-volt, 3-phase, 60-cycle motor, the two motors being operated by one turbo-generating set of similar voltage and frequency. These motors are operated by automatic contactor controllers from a common master station, two control levers giving straight-line motion similar to the valve levers of the usual reciprocating engine installation.

While the geared steam turbine has shown some excellent results and the use of the heavy oil engine for propulsion purposes will probably be more extended, it will be seen from the above that this feature of electrical application on shipboard is receiving continued attention, and its further application is to be predicted.

A combination which may receive a good deal of consideration in the future in this connection, especially for equipments of average size, is the operation of one or two generating sets by oil engines instead of steam turbines, the generators to operate the propelling motors as at present. Such an arrangement provides the advantages of the use of fuel oil, at the same time retaining the flexibility of the electrical drive and permitting oil engines to be furnished without reversing features.

We feel it is unnecessary at this time to refer in detail to the wide application of electricity in the American Navy, or to the very satisfactory results which have been obtained from practically all of the apparatus so driven.

In addition to the advantages which have been considered and resulted from electrical installations on naval vessels, numerous specific advantages are apparent in connection with such installations in the merchant marine, including frequently a saving in space and weight in the installation of the auxiliaries themselves, a very much higher efficiency of operation and consequent saving in total fuel consumption, the elimination of long and objectional lines of steam piping, which on certain classes of cargo vessels are nearly always installed above deck and result in continual steam condensation; also, on certain of the auxiliaries, particularly those requiring varying speed and load conditions, the electric motor offers some distinct advantages over the use of the steam engine.

SOUTH AUSTRALIAN HARBOUR REGULATIONS.

The Board of Trade notify that the following Regulations were made by the Governor of South Australia in Council on November 8 and December 20 last, respectively, under the provisions of the Harbours Act, 1913:—

Ballast Ground for Port Victoria.—Notwithstanding anything contained in any previous regulation, ballast shall not be discharged from any ship at the above port except within the limits hereunder defined, viz., to the westward of a line from which Rocky Island bears N. by E. $\frac{1}{2}$ E., and northward of a line from which the south extreme of Wardang Island bears west. The penalty for a breach of this Regulation shall be a sum not exceeding £50, and the offender shall be liable to pay the expense incurred by the Board in the removal of any ballast improperly discharged.

Transshipment Charges on Bunker Coal.—Notwithstanding anything contained in the regulation made under the Harbours Act, 1913, and dated September 27, 1917, whenever the transshipment charge has been paid to the Board on coal placed into lighters for bunkering purposes, no further transshipment charge shall be chargeable and paid when such coal is transferred into steamers' bunkers from such lighters. This Regulation shall take effect as from September 27, 1917.

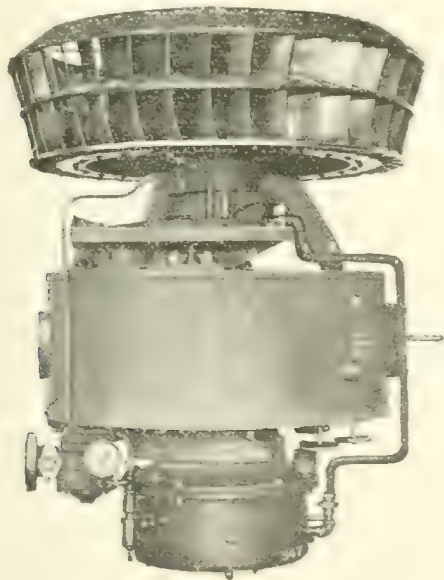
THE TERRY TURBINE-DRIVEN FANS.

In his report, "The Development of Machinery in the U.S. Navy during the Past Ten Years," Captain Dyson drew attention to the success which had attended the adoption of the turbine-driven fan for the production of forced draught in stokeholds of battleships and destroyers of the U.S. Navy. One of the great sources of the failure of these ships to hold high speed for any long continued period of time with all classes of vessels, had been the continually recurring breakdowns of forced draught blowers with engines of the reciprocating type. Fans driven by electric motors had been tried, by means of which the blowers of large diameter and slow speed of revolution had been replaced by blowers of smaller diameter and higher speed of rotation, the revolutions per minute being increased from 225 to 650, giving a much smaller and lighter machine, and vastly increasing the durability and the reliability of the system.

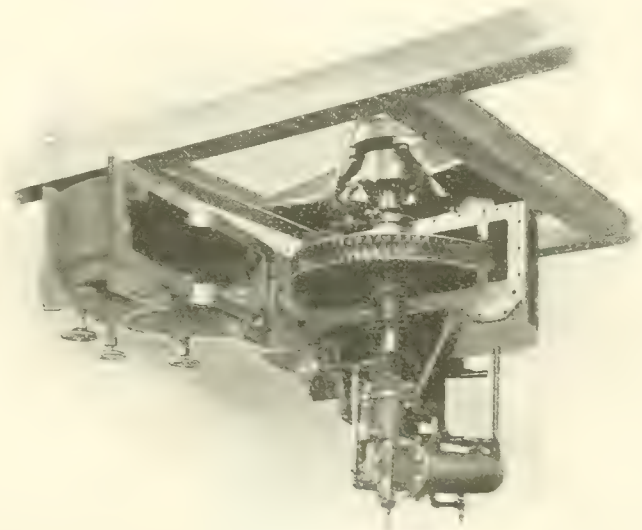
The great drawback of the electric motor was its lack of flexibility of control, and this led the American Bureau of Steam Engineering to scan the market closely to find turbine-driven blowers of proper design to instal for the work required. Not being able to find any such in existence, it succeeded in awakening the interest of the

tive Terry type consisting of a single wheel enclosed in a cast-iron casing split parallel to the shaft. The main features contributing to its success are rugged construction, extreme accessibility, and the unusually large, well lubricated thrust and steady bearings. The thrust bearing runs entirely submerged in oil and both the upper and lower bearings receive oil under pressure from an oil pump submerged in the oil reservoir. It will be noted from the illustration below that the upper bearing housing rests on the foundation plate rather than being held upward by bolts under tensional strain. The steam and exhaust connections are on the rear half of the casing, to which half the foundation plate is also attached. This construction allows the turbine casing to be swung open and the entire rotating elements, including both bearing housings complete, to be removed without disturbing the turbine alignment, the governor mechanism, or any pipe connections whatsoever, and without removing the coupling from the shaft.

The steam action is so different from other turbines that it deserves mention, particularly because it makes possible the extreme reliability obtained with the Terry turbine. Instead of striking the side of the turbine wheel the steam strikes the rim. It expands in the nozzle from approximately boiler pressure to the exhaust pressure. Issuing from the nozzle at high velocity, it



Terry Turbine, with Vertical Shaft, Driving Forced Draught Fan.



Turbine, with Vertical Shaft, Opened for Inspection.

Terry Steam Turbine Company, of Hartford, Conn., and the company developed what turned out to be a very satisfactory machine, so satisfactory indeed that Captain Dyson describes the adoption of this type of turbine for the driving of fans as "of even more value, if possible, than the adoption of steam turbines for the main propelling engines."

Doubts were at first expressed on the question of the steam consumption of these small turbines, but it was pointed out that with feed heaters installed and with turbine main engines, in which the excess of auxiliary steam can be used in the heaters and in the low pressure stages of the turbines, the steam economy of auxiliaries, which are only used when the main engines are in operation, or used to only a small extent in port, does not cut any great figure in the general economy of the machinery plant.

For marine service the Terry Steam Turbine Company manufacture both a vertical and a horizontal turbine, the vertical turbine being utilised for the driving of fans, and the horizontal turbine for driving dynamos and pumps. The Terry turbine forced draught fan set for use on board ship consists of a vertical turbine on which is mounted a fan as shown above. The turbine is of the distinc-

strikes the side of the bucket, in which its direction is reversed 180 deg. As this initial impact absorbs only a part of the total energy, the jet of steam passes into a stationary reversing chamber which turns it back upon the wheel a second time. This action is repeated several times until all the energy is absorbed from the steam. This principle of operation makes for higher efficiency at low speed, because more reversals can thus be had and accordingly more energy abstracted from the steam than in the type of turbine where the steam strikes the wheel at the side. With this efficiency there is further obtained simplicity and a practically trouble-proof wheel.

The wheel is cut from solid steel and the buckets are milled in the rim. There is thus no possibility of buckets becoming loose. The power-producing action of the steam takes effect only on the curved surface at the back of the bucket. As the only function of the blades is to split the steam jet, close blade clearances between the reversing chamber and buckets are avoided. Clearances at the side of the wheel are larger in every case, being more than $1\frac{1}{2}$ in.

The horizontal Terry turbine is built with the same care in design, causing it to be extensively used for driving condenser

auxiliaries, boiler feed pumps, general service pumps, and auxiliary light and power sets aboard ship. In order to obtain ease of access to the interior for inspection or repairs, the casing is split horizontally. The steam inlet and exhaust connections are on the lower half, so that the upper half can be removed without disturbing

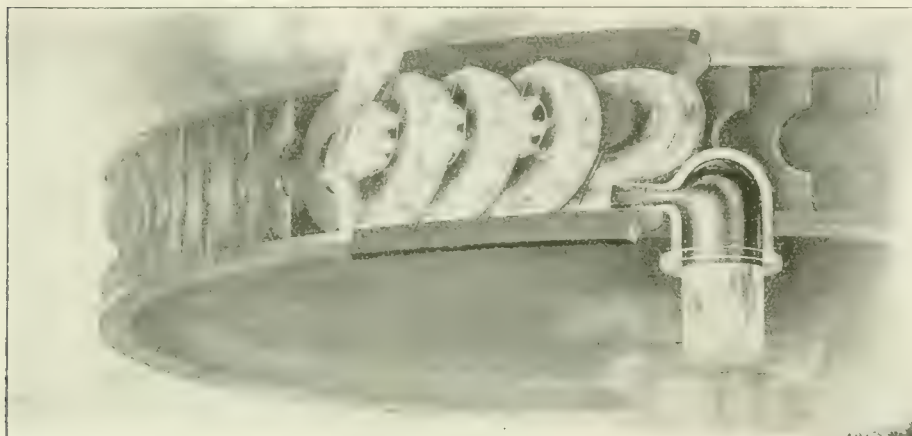
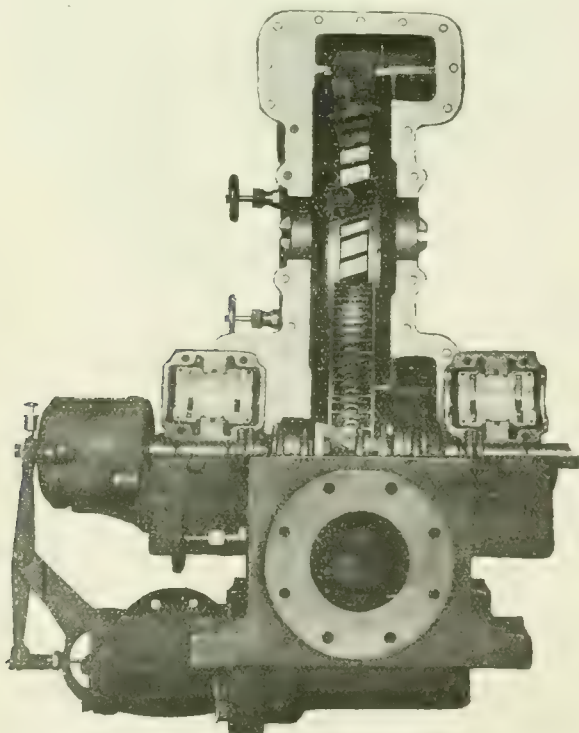


Diagram showing Action of Steam in Rotor of Terry Turbine.

them or the alignment of the unit. This same principle is maintained in the design of the bearings and bearing covers, the bearings being split and arranged so that the lower half can be rotated and removed and a new one put in without disturbing the shaft. The oil wells are large, permitting ample radiation. In the case of slow speed turbines, the oil is supplied to bearings by oil rings,



Terry Turbine with Horizontal Shaft opened for Inspection.

while with high-speed machines oil is supplied under pressure from a pump driven either from the turbine shaft or from the reduction gear shaft in case such a gear is used. Oil rings are used in addition to insure lubrication should the forced feed supply be stopped.

The governor is of the flyball type, and is mounted directly on

the turbine shaft. It controls the admission of steam by means of a balanced valve. Admission to each individual nozzle is in addition governed by a hand valve. This control permits obtaining practically full-load economy at partial loading. It further makes possible the purchase of a turbine to meet both present and future requirements with good efficiency under both conditions.

The Terry turbine is particularly valuable for marine plants because of its light weight and small space occupied for a given amount of power. It is used extensively in the United States, British, Italian and Chinese navies, and also on yachts, merchant ships, &c., throughout the world. Fraser & Chalmers, of Erith, Kent, represent the Terry Steam Turbine Company in the British Empire for all but forced draught work. Yarrow & Co., Ltd., Glasgow, Scotland, furnish Terry forced-draught equipment for marine installations. The Terry Steam Turbine Company, Hartford, Conn., have recently issued a booklet describing the turbine and its application more in detail, and have advised us that they will send a

copy to any of our readers mentioning *Shipbuilding and Shipping Record* in their request.

HARBOUR IMPROVEMENTS AT YOKOHAMA.

A communication from His Majesty's Consul-General at Yokohama states that on December 2 last the old pier, completed in 1896, which has been under reconstruction for some years, was re-opened to traffic, and is a valuable addition to the already excellent landing and shipping facilities afforded at the Customs quays. The length of the reconstructed pier is 1,212 ft., exclusive of an iron bridge 420 ft. long which connects the pier with the shore. The depth of water at low tide is 35 ft. on both sides of the pier, which can accommodate four vessels of this draught at one time two on each side. The width of the pier is 138 ft., the centre being occupied by two wooden two-storied sheds, each 330 ft. long and 60 ft. wide, covering an area of 2,200 square yards on the ground floor and 1,100 square yards on the first floor. The upper stories are both used for the reception and despatch of passengers. The ground floors of both sheds are to be used for the storage of cargo, while in one of the sheds will be the baggage inspection offices. Railway lines run the whole length of the pier, which is electrically lighted.

The Customs quay wall, completed about 1912, affords the following accommodation for vessels to moor alongside:—

Depth of Water at Low Tide.	Effective Length.	Total Length.	Number of Vessels Moored.
35 ft.	612 ft.	762 ft.	1
28	3,162 ..	3,762 ..	6
25	960 ..	990 ..	3
20	942 ..	1,086 ..	3
16	..	186 ..	..

On all the quays are capacious iron sheds, which altogether cover about 12 acres, and all have railway connection. The whole Customs enclosure, including roads, sheds and quays, is excellently lighted by electric light.

On the quays the following cranes are installed: Six 5-ton and sixteen 1½-ton travelling electric cranes, one 50-ton hammer-headed electric stationary crane, and one 20-ton stationary steam crane for lighters.

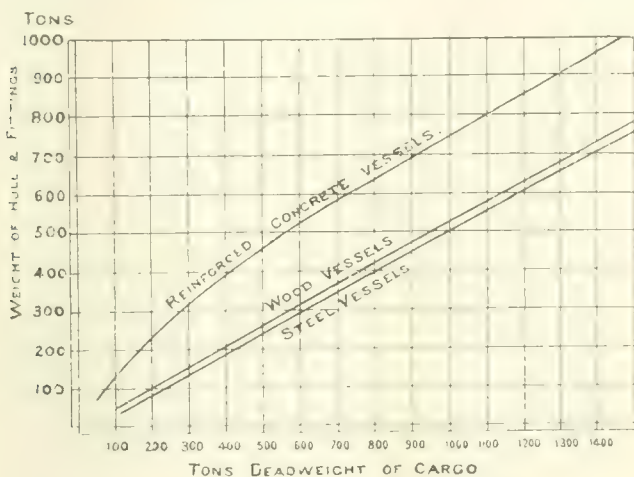
The total area of the harbour enclosed in the breakwaters is about 1,200 acres, the centre part of which has been dredged to a depth of 35 ft., while about 500 acres is not less than 28 ft. deep at low water.

REINFORCED CONCRETE VESSELS.*

BY WALTER POLLOCK.

The first reinforced concrete boat was a small rowing boat built and patented by M. Lambot, of Carces, France, in 1849. Apparently nothing further was done until 1887, when the sloop *De Zeemew* was built in Holland, and has been in constant service since, including work among ice, and is reported to be still in good condition. In 1896 C. Gabellini, of Rome, made a rowing boat by plastering cement and sand on both sides of a steel wire mesh making a total thickness of 1 in. In 1905 this same firm constructed the lighter *Liguria* and, following its seagoing trials, several other cargo vessels. It is stated that there are now in Italy vessels and pontoons which have been tested under severe loading to the satisfaction of Italian naval officers. In 1909 a barge or lighter carrying 220 tons was built in Frankfort-on-Main for the transport of gravel.

In 1910 a concrete scow was built in San Francisco 100 ft. by 30 ft. by 7 ft., and of 525 tons carrying capacity. In 1911 concrete barges were built on the Panama Canal, 64 ft. long by 24 ft. wide, with a depth of 5 ft. 6 in. In the same year a barge was built by Mr. O. F. Lackey, of Baltimore, length 50 ft., breadth 22 ft., and depth 7 ft., carrying 86 tons of cargo. As a result of the experi-



A.—Curve of Comparison of Weights.

ence with this barge a concrete scow of 500 ton was built in 1912 by the First Concrete Scow Construction Company, of Baltimore.

Among more recent constructions may be mentioned the *Namsenfjord*, a coaster of 200 tons d.w. built by the Fougner Company, of Norway, in 1917. The *Beton I*, another 200-ton vessel, was launched keel uppermost in August, 1917, by the Porsgrunds Company, Norway. A 5,000-ton d.w. capacity vessel is now being built in San Francisco, length 320 ft., breadth 45 ft., depth moulded 31 ft., draught 24 ft., and is to be fitted with steam machinery of 1,750 h.p.

For river and harbour lighters, tugs and coasting vessels, this form of construction will, if all the present experimental vessels are successful, probably remain a recognised form of construction for some years to come. Steel vessels may come back to their own as soon as freights are low and the competition keen. For larger vessels, up to say 2,000 tons d.w. capacity, reinforced concrete will no doubt prove a practical and commercial proposition for a few years.

Particulars are given above of a vessel of 5,000 tons being constructed in San Francisco, but it is difficult to see the advantage of using concrete in this case, as the amount of steel required for reinforcement, &c., will probably amount to 75 per cent. of that of a steel ship of the same deadweight capacity. The gain, together with the saving in skilled labour, seems hardly sufficient to warrant the increased weight. It therefore seems probable that immediately the really critical situation as regards steel and skilled labour is passed, large vessels will no longer be constructed of concrete.

Designers and builders are striving to produce a reinforced concrete vessel:—

(a) That will as nearly as possible reduce the weight of the hull to that of a steel ship of the same deadweight capacity.

(b) That will contain not more than one-quarter or one-fifth of the steel that is required in a steel ship.

(c) That will be sufficiently strong and safe with a thin concrete hull to stand stresses and ordinary knocks and at the same time have the necessary density to ensure watertightness.

(d) With a concrete that will not fracture by expansion and contraction, and that can be protected from disintegration in contact with acids, &c.

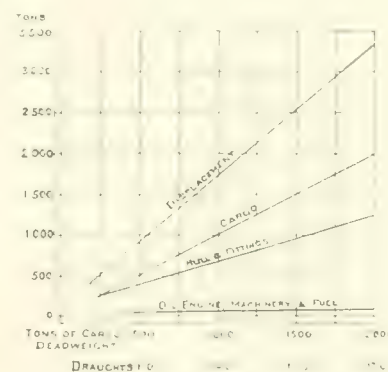
(e) That can be launched quickly after completion, without danger to the concrete work.

(f) That after bottom and side damage has been repaired, can be put to work again quickly without waiting several weeks for the repair work to set and harden.

From the naval architect's point of view there are no great difficulties in the design and construction of concrete vessels. River vessels have to provide only for ordinary hydrostatic pressures, except where they have to ground on an even bottom, and the shocks and stresses due to coming in contact with other vessels, quay walls, &c. Seagoing vessels have to provide for dynamic forces due to mooring, berthing, docking, &c., as well as sagging, hogging, and torsional strains when striking or falling in a heavy sea. The vibration of a ship in ballast after striking a wave may be found one of the most serious problems in concrete ships.

The bending and hogging strains due to wave conditions can be readily calculated, but the torsional and racking strains cannot. Shallow-draught and river vessels, having as a rule only the strains due to unequal loading, grounding, &c., thus allow the scantlings to be lighter than is necessary for seagoing vessels.

The ideal design would appear to be a vessel with longitudinal construction (dispensing with two-thirds of the usual floors and frames), fitting only a few web-frames and as



B.—Displacements, Weights and Cargo.

many bulkheads as possible, and in addition to the usual longitudinal rods, a series of diagonal ones. In larger size vessels it would no doubt be advisable to fit a centre bulkhead for the full length of the ship, but in any case it is advisable for cargo vessels to have the hatch coamings continuous all fore and aft, as shown in Fig. 1. In smaller vessels a continuous carling, even if it projects 6 in. above the deck, is desirable.

The calculations are in general similar to those of a steel ship. A set of curves of bending moments and shearing forces for a 300-ton deadweight vessel are given in Figs. 4 and 5.

It is not difficult to design a reinforced concrete vessel with graceful form, nice curved lines and a handsome sheer, though difficulty and expense are involved in building and in keeping the steel reinforcement in place during moulding and casting. To overcome these difficulties, the author designed the "straight-lined" vessels in July, 1917, and published a number of designs wherein all the transverse sections are straight lines throughout the ship, the sheer being also in straight lines. The central portion of the ship for more than two-thirds of the length is rectangular, except for the angle of the bilge which forms a double chine (see Fig. 3 and Fig. 7).

If the steel reinforcement is not kept in its proper position both vertically and horizontally in the thin slab walls of the shell, bulkheads, hatch coamings, bulwarks, casings, &c., a considerable amount of the strength of the reinforced concrete structure will be sacrificed. It is almost impossible to keep all the steelwork in its proper position, and a deviation of the bars one side may bring them so close to the surface as probably to throw off the concrete, or if set inwards to considerably reduce the strength of the slab locally. Furthermore, if the steel rods be not true to line, they tend to straighten out when subject to a tensile pull and cause the concrete to burst off, besides reducing their effectiveness by introducing secondary stresses.

The unit method of construction is being tried, but the advantages for ship work have yet to be proved, while the disadvantages are

* Abstract of a paper read at the 59th Session of the Institution of Naval Architects, March 22, 1918.

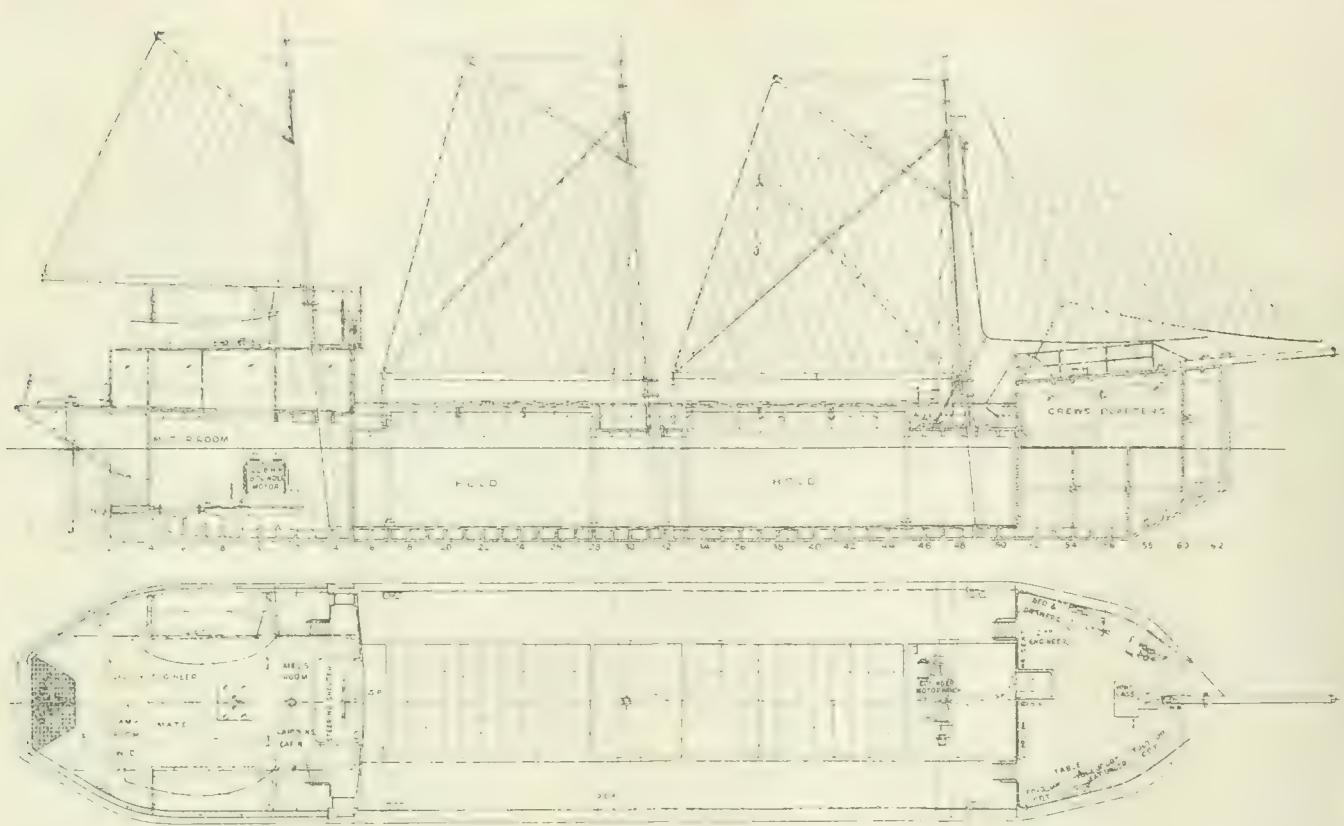


Fig. 1.—General Arrangement of Reinforced Concrete Motor Coaster. 125 ft. b.p. x 25 ft. x 11 ft. 9 in., moulded.

serious; so that the monolithic system, which makes it easy to obtain continuity of strength, is almost universally used.

For small vessels, barges, &c., a slab form of construction (Fig. 10) should be much more economical, as it dispenses entirely with floors and frames, side keelsons, stringers, beams, &c. The shuttering, being reduced to a minimum, is quickly placed in position and more rapid construction attained.

Bulwarks and hatch coamings are difficult to design for avoiding damage whilst loading or discharging cargo. The former can therefore be dispensed with and hinged stanchions and lifelines substituted, especially if the hatch coaming is made continuous. The latter should have a strong top and rest bar to avoid damage (see Fig. 9).

Fenders are necessary for all concrete vessels to protect the concrete, but in an experimental barge of 130 tons d.w. capacity fenders have been entirely dispensed with on the advice of the concrete designer, the corners of the gunwale being well rounded and finished off with a mortar of one of cement to one of sand, so as to avoid being chipped when coming in contact with or striking other barges. A solid half-round for the gunwale, as shown on Fig. 10, and other chafing irons, are desirable and may prove an advantage. It would be advisable to fit fenders to all vessels as a precautionary measure, at least for the present, following the usual method of fitting close against the concrete work instead of a few inches off the shell with wood chocks in way of the bolts. A fender at the bilge, as shown on Fig. 9, will protect the concrete,

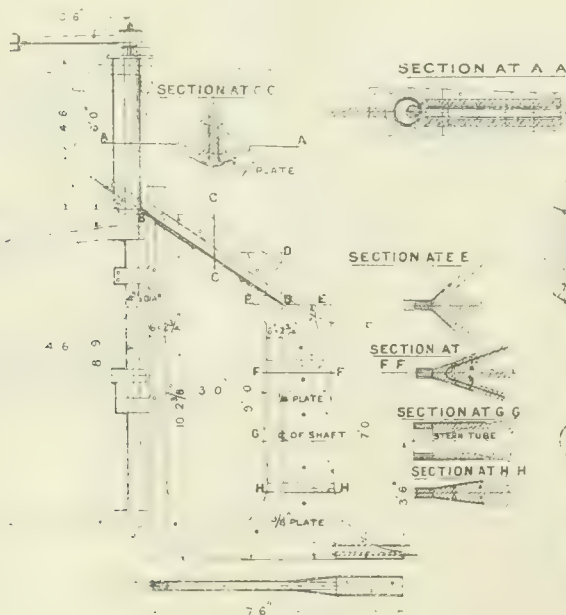


Fig. 2.—Patent Stern Frame for 125 ft. Reinforced Concrete Motor Coaster.

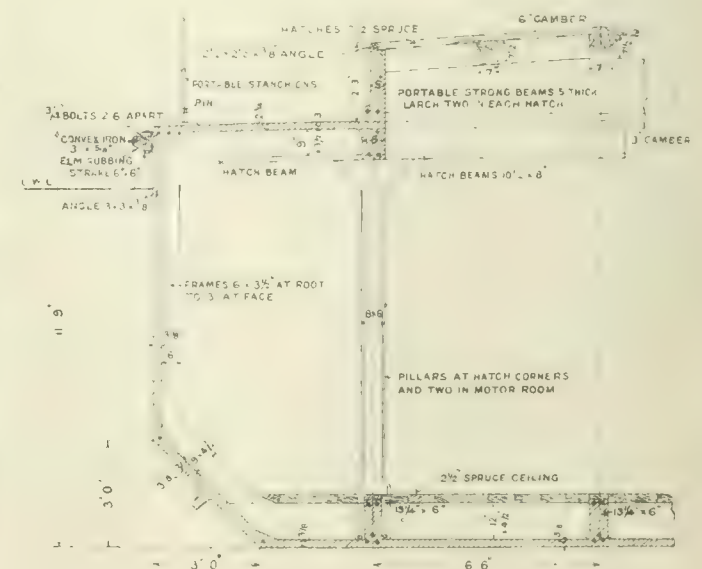


Fig. 3.—Midship Section of 125 ft. Reinforced Concrete Motor Coaster.

and at the same time act as a bilge keel. All edges of corners throughout the vessel should be rounded or bevelled where possible to prevent being chipped or broken off. If the concrete is subject to considerable rubbing or chafing it will wear away.

There are the following methods of reinforcement:—

- (a) Wire netting, expanded metal, and similar meshwork with or without bars.
- (b) Flat bars, special bars, steel joists, &c.
- (c) Round bars of varying diameters.



Fig. 4.—Crest of Wave. 1,300 ft. tons maximum bending moment (hogging).

All of these are suitable for either the unit method or the monolithic method of construction, and may be used either singly or in combination.

The wire netting and expanded metal is not likely to be adopted for the shellwork of seagoing vessels, because of the difficulty in keeping it true to line and obtaining homogeneity, as well as its excessive cost and the difficulty in varying the network sufficiently to suit the stresses.

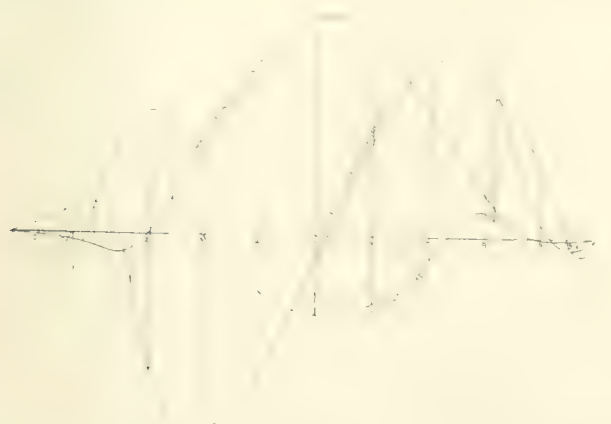


Fig. 5.—Hollow of Wave. 1,230 ft. tons maximum bending moment (sagging).

Various sections other than round bars have been adopted in a number of cases, especially in America, but no doubt the round bars will be generally adopted, because they utilise the steel without waste, are easy to arrange in position, easier to bend, more readily obtainable, and adapt themselves to a minimum quantity of concrete. Some claim that mechanical bond bars (to which kind all special bars belong) develop greater adhesion than round bars, but many reinforced concrete experts think the claim fallacious.

The larger steel bars are arranged longitudinally, generally in way of the deck line and the bottom of the ship, while there are also rods of nearly the same size arranged transversely, the whole being connected by small bars from $\frac{3}{8}$ in. to $\frac{1}{2}$ in., forming say a 6-in. mesh over the whole surface, making as far as possible a monolithic structure, a reduction in the number or total sectional area of the rods, both longitudinally and transversely, being arranged towards the ends of the vessel.

There are four methods of jointing the steel rods: (1) by a long overlap, (2) by a short overlap with hooked ends, (3) by welding, and (4) by turnbuckles or other mechanical attachment. The long overlap, which is usually 40 diameters of the rod, although some go as low as 20 diameters, relies entirely upon the adhesion or grip of the concrete to the bar. The short overlap, of say 12 diameters in the small rods and 18 diameters in the rods over 1-in. diameter, relies mostly upon the hooked ends and appears to be a satisfactory solution, as it reduces weight without sacrificing strength. Welding is certainly the most economical as regards weight, but if done in the shop makes the rods difficult to handle and keep in shape, and if in place may result in a local weakening of the rod at the weld. A mechanical connection such as a turnbuckle, to unite screwed ends of the rods, is sometimes adopted for special purposes. The cost of welding and mechanical connection is usually considered prohibitive. In each of the above cases the loss due to the weakness of all riveted seams or butts in a steel ship is avoided.

In order to resist the diagonal tensile stresses induced in a beam by the action of the shearing force, stirrups are frequently introduced extending between the tension and compression members. They may be considered as the web members of a truss system, the

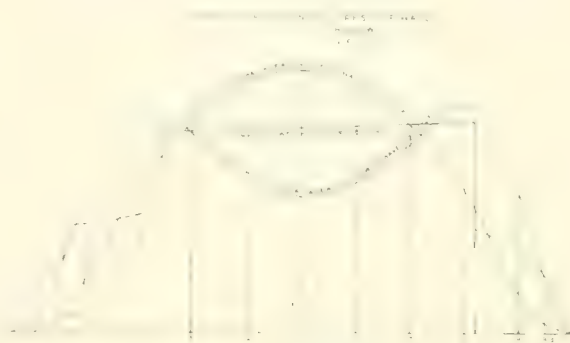


Fig. 6.—Curves of Buoyancy.

triangulation of which will vary as they are placed vertically or diagonally.

While there is a well-defined theoretical method employed by designers of reinforced concrete structures for the determination of the sections, the calculations depend upon the use of coefficients determined from experiments which have all been made upon concrete under the conditions in which it is employed in buildings, and consequently the experimental data for shipbuilding work have yet to be derived. For this reason the paper leaves out consideration of the usual practice in allowable stresses which might, if included, lend colour to the supposition that calculations could be made quite definitely on present experience.

For deriving the equations for determining the properties of reinforced concrete sections, it is necessary to know the moduli of elasticity for concrete and steel and the ratio as used in combination, because, while the modulus of steel is fairly constant up to the yield-point and is well known, the modulus of concrete vary with the quality of the concrete and the stress upon it, the modulus being greatly reduced as the stress increases. Therefore, in a reinforced concrete beam the ratio of the moduli of elasticity that is used for determining the position of the neutral axis and the other properties of a section is not the ratio that exists between the initial moduli of elasticity of the two materials. As the modulus of the concrete would vary to some extent with the constant or intermittent immersion in water, it is evident that the ordinary modular ratio of 1 to 15 that is used for structures may not be at all appropriate, having regard to the richer mixture of concrete employed and the greater factor of safety previously advocated.

The resistance of concrete to tension is generally neglected, and it seems desirable to neglect it in ship design, but attention should be given to the fact that concrete is comparatively weak in tension, and therefore may be rather unsound for some part of the full thickness of the section, and consequently the watertightness depends on a section of less thickness.

It seems advisable at the present time to employ a factor of safety of 6 as regards the crushing strength derived from experiments on concrete blocks made in the ordinary way and allowed to dry out in the air, such crushing strength being that obtainable at

three months. It will be found advantageous to employ concrete richer in cement than that ordinarily used for buildings, and made with ballast or other coarse material (sometimes called aggregate) restricted in size. There is also another element in question, as to what reduction in stress, if any, should be allowed in concrete which is always kept in water and that which is alternately wet and dry, while it is necessary in addition to ascertain what effect

The linear increase (length, breadth, and depth) would be 12 per cent. to 14 per cent. greater for a concrete vessel than for a steel vessel.

The figures in the table of the 300-ton concrete vessels are based on the ordinary method of construction as shown in Fig. 1, and not the author's improved method of construction shown on Fig. 8.

The practice of stating that a concrete hull is from 50 per cent.

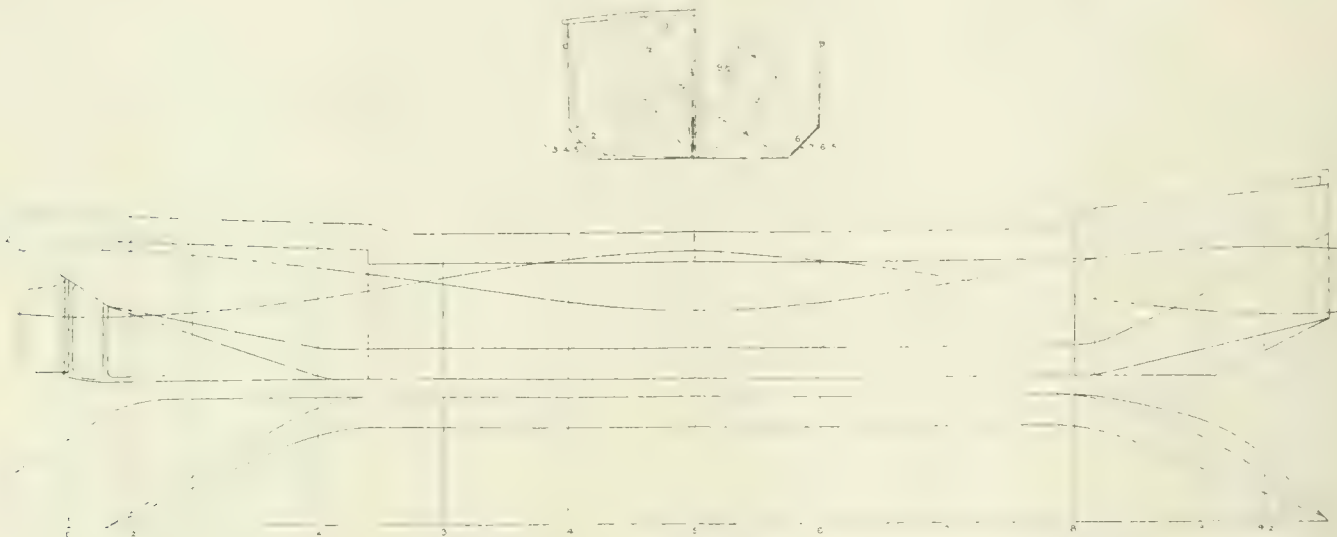


Fig. 7.—Lines of modified type of Reinforced Concrete Coaster.

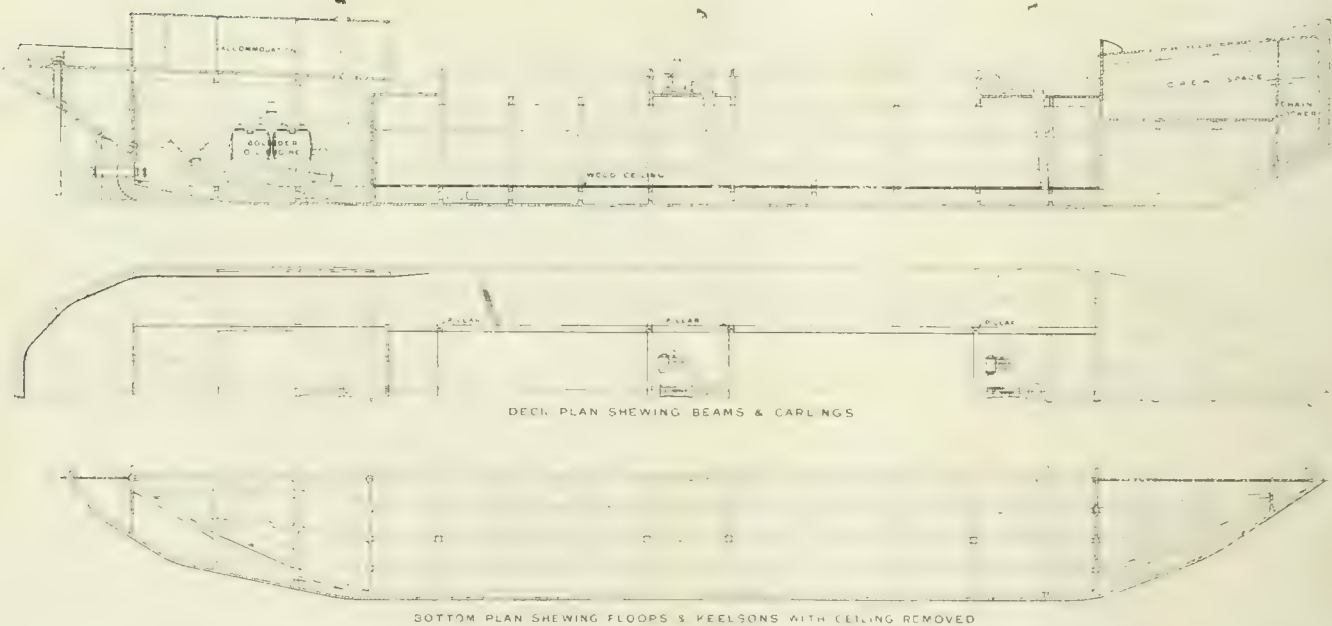


Fig. 8.—General Arrangement of 500-Ton Reinforced Concrete Coaster. 155 ft. b.p. $\times$ 29 ft. 6 in. $\times$ 13 ft. 3 in., moulded.

salt water has on the strength of concrete as used in a vessel, although data go to show that salt water has no effect on a dense concrete.

The weight of reinforced concrete hulls is the most serious problem in the adoption of this type of vessel, the concrete being 143 lb. per cubic foot, plus the reinforcement. The bare hull with fittings of a coasting vessel of, say, 300 tons d.w., will weigh 130 per cent. more than that of a steel vessel, while the increase in total displacement is about 40 per cent. (see table, page 389). Put in another way, if a concrete coaster was built of the dimensions and coefficient of fineness of a 420-ton d.w. steel vessel, it would only carry 300 tons d.w. on the same draught.

to 70 per cent. heavier than a steel vessel of the same dimensions does not give a fair comparison, because the concrete hull would carry much less cargo. The method of comparing the weights to vessels of similar d.w. has therefore been adopted.

It will be seen that the total steel is only 27 per cent., the reinforcement alone accounting for 25 per cent. of that of a steel vessel of the same d.w. capacity.

The weight of the bare hull of the 500-ton vessel, illustrated by Figs. 8 and 9, is only 400 tons, which shows a reduction of 15 per cent. as compared with the figures of the 300-ton concrete vessel.

A 1,000-ton d.w. towing lighter would weigh about 90 per cent. to 100 per cent. more, the displacement being about 25 per cent.

more, and the linear increase 7 per cent. more than that of a steel lighter of the same d.w. The percentage difference in weight gradually decreases up to, say, 2,500 tons d.w.

COMPARISON OF A 300-TON D.W. VESSEL IN CONCRETE, WOOD AND STEEL.

	Reinforced concrete.	Wood.	Steel.
Length	125 ft. 0 in.	108 ft. 0 in.	105 ft. 0 in.
Breadth	25 ft. 0 in.	23 ft. 9 in.	21 ft. 9 in.
Depth	11 ft. 9 in.	10 ft. 7 in.	11 ft. 4 in.
Draught (bottom to keel)	10 ft. 3 in. (no keel)	10 ft. 3 in. (keel)	10 ft. 3 in. (no keel)
D.w. range, tons	200-300	200-300	200-300
Cubic capacity of holds and hatch ways, ft.	17,500	12,350	12,350
Displacement, tons	400	400	400
Time to construct, months	4	8	6
Weight of steel, tons	—	10	11
Weight of bare hull, tons	20	14	12

The best concrete is the concrete that is the densest—the principal consideration is its permeability. To obtain the necessary density, the cement must be finely ground, the aggregate carefully graded and not too coarse, and the mixing thorough. If the concrete is too rich it is subject to greater contraction and cracks. It is made of cement, sand, and aggregate, and for ship work the proportions are usually of 1 to $1\frac{1}{2}$ to $1\frac{1}{2}$ by weight, although the author prefers to specify a mixture of 1 to 3 graded $\frac{1}{4}$ in. downwards.

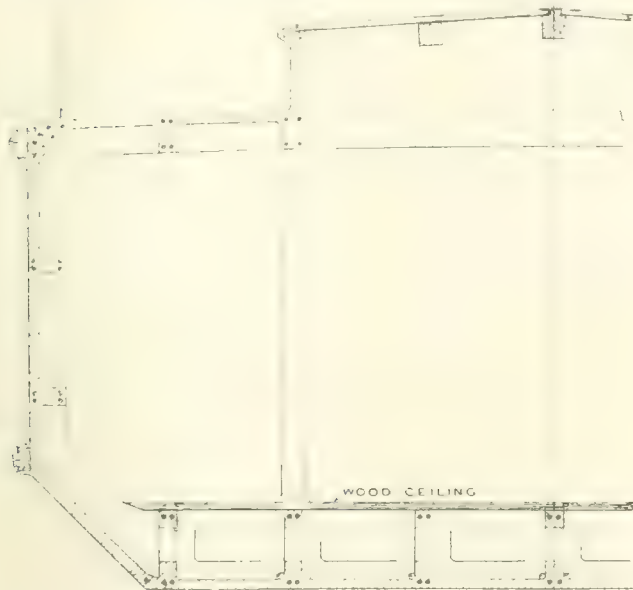


Fig. 9.—Midship Section of 500-Ton Reinforced Concrete Coaster.

The cement usually obtainable is to the British Standard Specification which provides for a residue on a sieve $180 \times 180 = 32,400$ meshes per square inch, not exceeding 14 per cent.

The steel for the rods is usually of shipyard quality of mild steel 28 to 32 tons per square inch tensile, although some reinforced concrete experts prefer medium carbon steel (to which category shell discard steel belongs) with 35 to 45 tons per square inch tensile, a contraction of area at fracture not less than 45 per cent., to withstand bending cold to 180 deg., around a diameter equal to twice that of the bar without fracturing the skin of the bent portion.

A minimum covering of the reinforced steelwork with concrete is desirable so as to reduce the weight of the structure, while, at the same time, it must be sufficiently strong to prevent the concrete from breaking away under the torsional and other stresses that a vessel is subject to. For the slab work it will be found necessary to have at least a covering of $1\frac{1}{2}$ in. of concrete over all the bars, floors, frames, and keelsons, and where heavy bars are used it is advisable to have a covering of not less than 1 in. of concrete, and even $1\frac{1}{2}$ in. may be necessary.

The deck may have a granite finish composed of $\frac{1}{4}$ -in. washed granite and cement gauged $2\frac{1}{2}$ to 1, laid at the same time as the under concrete, and sprinkled with fine carborundum before the casting is finished. The latest vessels being constructed by the author are having a chequer pattern cast in the finishing coat.

For a 300-ton vessel a 3-in. shell or slabwork will be found sufficient for a 500-tonner $3\frac{1}{2}$ in., and for a 1,000-tonner 4 in.

It will be noticed that in Fig. 9 it is proposed to fill a fillet of reinforced concrete under the wooden fender; this fillet could be arranged locally, say 10 ft. apart, or continuously all round the vessel in way of the fender, which would enable the construction of an external side stringer to be formed, the inside stringer being consequently reduced.

The section and longitudinal elevation of the 500-ton auxiliary coaster introduce several new features. The vessel having a length b.p. of 155 ft., breadth 29 ft. 6 in., and a depth moulded of 13 ft. 3 in. is designed on the longitudinal principle, the frames being spaced 8 ft. apart. The hold ceiling would be fitted transversely in a vessel of this type, the frames and keelsons being hollowed to reduce weight and the inside curvature of the shell slabs or panels facilitating the use of light steel shuttering.

The stern frame requires special consideration and design to ensure proper attachment to the reinforced concrete work, especially where a stern tube is fitted. Fig. 2 illustrates the author's patent stern frame, the construction in several pieces being really a war measure and designed to reduce the amount of forged work to a minimum. It will be noticed that the reinforced rods are well connected to the plates and angles. At present it is hardly worth

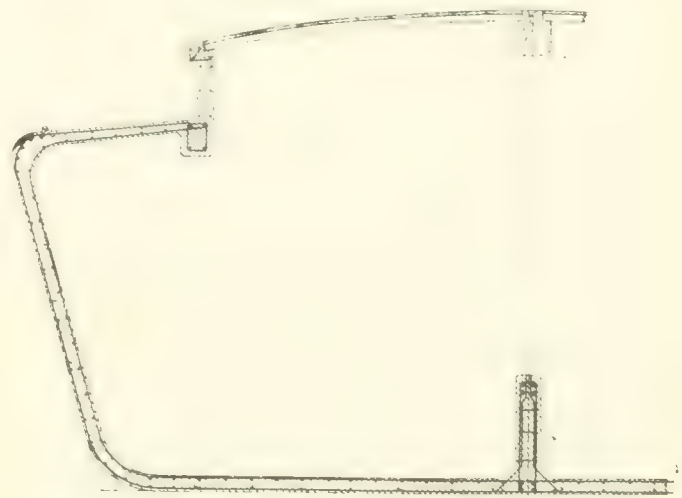


Fig. 10.—Midship Section of Reinforced Concrete Swim Barge (Wells system).

while to make the rudders of concrete, although this is quite possible for large ships; the same remarks apply to masts.

At present the shuttering is of wood; planed, tongued, and grooved boards are desirable to obtain a neat fair surface or finish of the concrete work. For a large number of vessels of the same type it would probably be more economical, even at the present time, to use cast-iron shuttering. Pressed-steel shuttering would have advantages. Then, again, there is a possibility of reinforced concrete shuttering being used.

The prime cost of the finished reinforced concrete work for an ordinary vessel with ship-shaped lines at the present time should average £8 15s. per ton, made up with the double shuttering at 18s. per square yard for timber and 6s. 6d. for labour—the concrete at 1s. 8d. per cubic foot, and the round steel bars from £16 10s. per ton for the large diameter to £22 10s. per ton for the small diameters. Vessels with straight lines will cost less, and probably a saving of £1 to £1 5s. per ton will be made, the usual establishment charges and profit being added. These figures are based on a 300-ton d.w. coaster, and for the first vessel only. Larger vessels would, of course, show a reduction.

Taking the hull complete and comparing with steel and wood construction, even if the steel is obtainable at £11 15s. per ton, concrete vessels of the same d.w. should, if standardised, be constructed at 20 per cent. less cost than a steel vessel, and 10 per cent. less cost than a wooden vessel. The machinery for propulsion will, of course, cost more because of the extra displacement.

With regard to the time for construction after, say, three building berths have been prepared: with ample labour available, and after the first vessel has been cast, the one set of shuttering, so long as it lasts, should enable a barge of 130 tons d.w. to be completed and launched every ten weeks, a 300-ton d.w. coaster every sixteen weeks, and a 1,000-ton d.w. coaster every twenty weeks.

INSTITUTION OF NAVAL ARCHITECTS.

(Concluded from page 365.)

THE DESIGN OF CONCRETE SHIPS.

An abstract of Mr. Pollock's Paper appears on pages 385-389. We conclude our report of the discussion on the papers on concrete ship.

Mr. E. O. Williams, referring to Major Denny's statement that the tensile strength of any concrete mixture was so low that all text-books and regulations agreed in placing it at zero for practical purposes, said it might be inferred from this that the tensional strength of concrete was of no practical interest in a watertight concrete structure. This was not the case. All reinforced concrete watertight structures should be designed so as to have a factor of safety against initial cracks. That was to say, when the maximum stresses come upon the material the ultimate tensile value of the concrete working in conjunction with the steel should not be exceeded. In addition to this the steel should be sufficient in itself to take the maximum tensile stress even if the concrete should crack. Thus, in a watertight concrete structure there were two considerations of design: (1) That the structure should have a factor of safety, however small, against initial cracks. (2) It should have a factor of safety against final failure. It might be understood from Major Denny's statement that it would not be of any practical significance if the tensile value of the concrete were increased, but he evidently saw the importance of this, for he stated that an analysis of the effect of shearing forces showed that tensile forces were set up. It was quite safe to say that it was the tensile value of concrete that at present fixed the limit of weight reduction of the hull, and it was for this reason that he attached much importance to a high quality cement, far in excess of British standard requirements. If the considerations outlined were followed in the design of a concrete ship the cracks that Major Denny stated there was every reason to expect in the tensional side of a reinforced concrete member should not occur. He wished to draw attention to the figures Mr. Thurston had given relating to the weight of cement, sand and stone, to give one ton of concrete. Cement, in the solid, as distinct from the loose, in which condition it contained a large percentage of voids, weighed 195 lb. per cubic ft. The figure of 192 ton of cement in one ton of concrete would thus represent 2.25 cubic feet of solid material. Sand, again, in the solid weighed 160 lb. per cubic ft., and thus the 3 ton of sand would represent 4.2 cubic ft. of solid material. With granite at 170 lb. per cubic ft., 508 ton granite would represent 6.7 cubic ft. of solid material. Adding the volumes of solid cement, sand and stone, a total solid volume of 13.14 cubic ft. was obtained, whereas the weights given were stated to represent 15.4 cubic ft. The difference in volume, 2.26 cubic ft., could, according to these figures, have no weight of concrete. This would indicate a porosity of 15 per cent. which would be alarmingly high for watertight concrete. Mr. Thurston would find a fundamental error in these weights in that they exclude the weight of water which was not lost but combined with the cement. Mr. Pollock's Paper contained much with which he was in entire agreement. It mentioned four methods of joining steel rods, but there was a fifth and the most economical method of attachment, namely, the lapping of bars combined with the welding of the ends. This method he proposed to employ in the near future. The efficiency of simple lapping was about 90 per cent.; for example, a 1 in. diam. bar of 35 ft. long lapping 40 diams. would have an effective length of about 31 ft. 6 in. or 90 per cent. of its length. If, however, the ends of such a bar were butt welded, and assuming that the efficiency of a welded joint was about 80 per cent., it could be shown that the resulting efficiency was 98 per cent. The welding should be done in position by a process such as the quasi-arc. Welding alone was certainly not, as Mr. Pollock stated, the most economical as regard weight, because the efficiency of a welded joint was seldom more than 80 per cent. of the bar, whereas that of simple overlapping was 90 per cent. Under "disadvantages" Mr. Pollock mentioned increased cost of building and launching ways, but the difference in cost between the mechanical plant required in the two different kinds of shipyards was considerable. To launch 1,000 tons d.w. of hulls per week, £40,000 of mechanical plant would be required in the steel shipyard, as against £6,000 in the concrete shipyard. It was advisable that the maximum sized aggregate should be as large as possible, and should be determined by the minimum distance between reinforcing bars; for instance, if bars were

never less than $\frac{1}{2}$ in. apart and never less than $\frac{1}{2}$ in. from the centering, the maximum size aggregate should be nearly $\frac{1}{2}$ in. He was not in agreement with the statement that smooth gravel should not be used, as the strength of the concrete depended on the binding of the cement on to the aggregate, which was as good if not better in the case of smooth round pebbles. Also, it was found that rounded pebbles worked better into position. It was a little dangerous to give shell thicknesses of different sized vessels, as the thickness should be determined by the shearing force on the whole ship, considered as a girder resting on a standard wave. Mr. Pollock seemed to favour longitudinal framing. Longitudinal framing could not assist in reducing the weight of the vessel unless the longitudinal spacing of transverse bulkheads was less than the width of the vessel, in which case it paid to carry all loads longitudinally on to the bulkheads. If longitudinals simply transferred the loading on to more widely spaced transverse members, the weight must be actually increased for the reason that no saving was effected in the transverse members, because, if spaced twice the distance apart each frame must be twice the weight, and then extra weight was added by the addition of the longitudinals. He agreed with Mr. Pollock that the best site for a concrete shipyard was where the climate was warm and damp, and preferably protected from the prevailing winds. He strongly disagreed with any suggestion of vibrating or agitating shuttering, as this must inevitably disturb the concrete that had just passed the stage of initial set. After going into the stresses induced in the ship during launching, he was of opinion that the bending moments and shearing forces induced did not exceed the maximum occasioned by heavy seas. The sections at which the maximum launching stresses occurred were not amidships.

Mr. B. J. Ives said the remark in Major Denny's paper that steel embedded in concrete was completely protected from corrosion should be emphasised. It was of great importance, and if shipowners insisted on repairs being carried out in those parts of their ships specially liable to corrosion by the application of concrete before the steel had been too much consumed, repair bills would be much smaller. In concrete vessels which had come under his examination, there was no likelihood of hair cracks developing into gaping cracks. In regard to the watertightness of the vessel, and the treatment of the concrete by a compound, this seemed unnecessary. In connection with the question of strength, the proper solution of this was to be found in combining the application of first principles, and by attempting to provide the same strength as was found in corresponding elements of a steel ship. None of the papers was very definite as to size, though it was evident that the percentage of steel reinforcement to total weight of reinforced concrete rapidly increased as vessels became larger. Major Denny gave 14 per cent. for the 1,000-ton barge and 22 per cent. for a 6,000-ton vessel. From experience obtained with Lloyd's Register of Shipping in studying the problem in this and other countries, it would appear that 17 per cent. to 18 per cent. would more nearly represent a correct figure for the proper weight of steel in a non-propelling barge of 1,000 tons, while for a 6,000-ton vessel no very definite figures had been obtained.

It must be remembered that there was a large variation in bending moment in the hogging and sagging conditions for a non-propelling barge of 1,000 tons deadweight which would not necessarily apply in a vessel with machinery; in fact, many designs had been considered by Lloyd's Register where the sagging moment was larger than the hogging moment. Dealing with larger vessels, Mr. Pollock estimated that the amount of steel required for reinforcement would be 75 per cent. of the steel required in a steel ship for a vessel of 5,000 tons deadweight, and would represent about 1,000 tons of steel reinforcement. This was at variance with Major Denny's estimate of 680 tons. It was extremely difficult to reach a conclusion as to limit of size, but civil engineers stated that a point was reached where the amount of steel necessary to take up the stresses was so great that reinforced concrete could be no longer usefully employed. Similarly, it was submitted that in the case of floating structures such a point would be reached especially as the tensional strength of all parts of the structure of a reinforced concrete vessel was solely supplied by the steel. Experience derived from steel vessels 375 ft. long in actual service showed that the stress on the gunwale of these vessels was about as high as the recognised authorities considered permissible. In a concrete vessel, the steel was not aided much by the concrete to take up tensional stress, and the amount of steel required in a ship 375 ft. long was considerably more than 680 tons. On the whole, it seemed doubtful whether it

would be wise to contemplate building ferro-concrete vessels longer than 250 ft. or larger than 2,000 tons deadweight.

Major Denny said that the effects of heat and cold on the grip of the cement on steel reinforcement was more in the province of the concrete engineer, but so far as he could ascertain from piles exposed in America, where there were very great differences of temperature, there had been no deterioration. He had learned a very great deal in the last three months on the technical side of the strength of ships, and he was glad to see from the remarks of Mr. Williams that the concrete was also overhauling his profession to a certain extent. During the next three months he thought we should see as the result of the great amount of detail work that had been lavished on the concrete construction programme, whether some of their ideas were sound or not, but he believed in the main they would not be disappointed with the results in service of the present programme of shipping.

There was not time for the other authors to reply.

The following two papers were read, and concluded the session:

AN INVESTIGATION OF THE SHEARING FORCE AND BENDING MOMENT ACTING ON THE STRUCTURE OF A SHIP, INCLUDING DYNAMIC EFFECTS.

By A. M. ROBB, B.Sc.

(Abstract.)

One object of the investigation was to obtain, if possible, a bending moment curve, or the "envelope" of a series of bending moment curves, which would be almost flat in the region of the maximum value. This object has not been realised; even if the effect of pitching be included, the bending moment curve maintains approximately its maximum value over a very short range. Accordingly the bending moments at the half-lengths are always considered less than the maximum values. The question then arises: Is it not possible, in many cases, to obtain sufficient longitudinal strength without maintaining the full midship scantlings over half the length?

A point of interest which arises from the pitching calculations is the effect of the pitching on the local loads. For example, it is seen that, due to pitching, the "virtual addition" to an element of weight in either end is practically equal to the normal weight; thus the weight of a windlass, say, may "virtually" be doubled as the result of pitching acceleration. Obviously the strength of the pillaring under the windlass is not affected by the acceleration, and so in any case of stiffening under a local load the effect of pitching acceleration demands some attention, bearing in mind always that the effect is maximum at the ends and minimum amidships. This consideration naturally leads up to the determination of the amplitude of pitching; it may be, for instance, that the combinations of pitching amplitudes and wave positions adopted in the paper are highly improbable in practice. It is suggested that this matter can be investigated in an experimental tank. Waves of a desired period can be created; the ship model can be made dynamically accurate. There remains only the observation of the motion. This might be carried out by means of the vertical cylinders used for measuring change of trim, an observer noting times at which wave crests passed the stem; alternatively, a cinematographic record might be made, the positions of the ship on the wave being given by a series of draught marks along the side. In this way maximum amounts of "heave" and of "pitch," separately and in combination, might be determined. Then, for example, it might be found that a particular combination of heaving and pitching would possibly produce an excessive bending moment. The corresponding buoyancy curve would be drawn and its area determined. The weight curve would be proportioned up to the area so found; this would take account of heaving. By means of the moment of weight curve the "virtual centre of gravity" would be placed in the correct position. Then from the amended weight curve and the buoyancy curve the shearing force and bending moment curves, including both heaving and pitching, would be obtained. It might even be possible to carry the investigation of the motion of the model a stage further and measure by means of special spring balances the variations of "virtual" weight along the length and so obtain curves of "virtual" weight for the model. These curves of "virtual" weight might be checked with the corresponding buoyancy curves, and so the application of the "Smith" correction tested.

THE AIR SUPPLY TO BOILER ROOMS.

By RICHARD W. ALLEN, C.B.E.

(Abstract.)

The subject is dealt with under the following headings:—

- (1) Air pressure required to produce air speed.
- (2) Velocity of air in the air shafts.
- (3) Enlargements and restrictions in the air passages.
- (4) Deck intake, cowl and weather flaps.
- (5) Velocity of air at the eye of the fan.
- (6) Necessity of fitting suitable inlet rings.
- (7) Stream-line shutters for fan inlets and their influence.
- (8) Loss of air pressure in the boiler room due to vacuum at fan inlet.
- (9) Increase in steam consumption of fan installation due to vacuum at fan inlet.
- (10) Increase of output due to properly designed casings.
- (11) Arrangement of deflectors on fan casings.
- (12) Direction of rotation of the fans; influence on distribution of air in the boiler room.
- (13) Oil fuel; quantity of air required for combustion.
- (14) Progress in fan design.

(1) Theoretically an air pressure of 1 in. water produces 67 ft. per second air velocity, but this does not allow for any practical losses. It will therefore be more correct to work on the basis of 1 in. water gauge pressure producing 54 ft. per second.

(2) The speeds to be recommended are from 20 to 25 ft. per second. The pressure required to produce this velocity is relatively small, viz., .13 in. to .20 in. W.G., but increases in the ratio of the square of the velocity. That air trunks are sometimes constructed necessitating very high speeds is proved by several recent cases brought to the author's notice. In many classes of ships, difficulties have been experienced in obtaining the specified air pressure in the boiler room, necessitating modification by increasing the areas of the suction trunks, with satisfactory results.

(3) From tests taken for steam in connection with investigations for nozzles, it must be assumed that the interposition of a chamber in a pipe run, causing a sudden enlargement in the pipe, even if this chamber were of no great length in the direction of the axis of the pipe run, is sufficient to destroy completely the speed of the fluid approaching the chamber through the pipe. It often happens that such sudden enlargements and restrictions occur in the passage from the top deck to the fan inlet eye. The loss would be considerably reduced by replacing the sudden enlargement by a well-tapered trunk giving a gradual enlargement. This, however, is frequently impossible owing to structural considerations on board ship. Therefore, to be on the safe side, it is as well, when making calculations, to assume that the whole of the energy represented by the air velocity is destroyed, and when designing the intakes to allow for moderate air speeds.

(4) The design of the deck intakes, with their cowls and weather flaps, has been so greatly influenced by the requirements of protection from waves and spray in bad weather, that less attention has been given to the proper admission of air without loss or restriction. A series of experiments has been made to establish the relative efficiency of different types of air intakes, including the designs generally in use, and also to discover the most efficient shape of entrance to conform to the natural line of flow. The essential requirement was to provide a guide which would perform the protective duty but at the same time induce the flow of air into the shaft, especially when partially closed against the weather. The design proposed to replace existing shapes offers a marked improvement in efficiency, namely, 83 per cent. against 35 per cent. The guides or shields are of stream-line section, and pivoted to the top of the air intake shaft so that they can be opened any desired amount. Two recent innovations, namely, the centre guide and nozzle, are embodied in the deck entry, the centre guide in the form of a deflector or inverted pyramid attached beneath the cowl top, and the nozzle providing a *vena contracta* flow at the entrance to the intake shaft. The centre guide and nozzle conform to the correct line of flow to prevent the formation of any eddies. Another improvement to which importance is attached is fitting of the diaphragms, placed athwartships, subdividing the air intake shaft. When a ship is travelling at a high speed there is a tendency of the air to rush past the intake without being drawn in, and for the air which does enter to bank up in the after side of the intake shaft, with a consequent tendency to starve the forward fans. By fitting diaphragms

the tendency to unequal air supply fore and aft will be efficiently counteracted, and all the fans will receive their due share of air.

(5) With an engine-driven fan the inlet eye can in most cases be made large enough to keep the inlet speed low without reducing the radial length of the blades too much. With a steam-driven turbine fan, in order to obtain an efficient turbine, the revolutions per minute must be kept fairly high, thereby reducing the fan diameter necessary for a given pressure. In order to keep an effectual radial length of the inlet eye must be reduced as compared with an engine-driven fan, and the entrance air speed accordingly increased.

(6) It is important to give proper consideration to this item, and to pay attention to the following points:—(a) Correct clearance; (b) angle of entry; (c) avoidance of sharp corners.

(7) Since the vanes are fixed, in order that they may operate most efficiently it has been found desirable to guide the air at the entrance to the fan-eye in parallel streams, normal to the fan inlet, and also to correct or dim the pulsations. The fan-eye shutter replaces the loose and hinged folding doors and the wire guard. It consists of a number of slats operated by a connecting bar or bars. A lever is attached to the pivot of each slat, and the ends of the levers are attached to a connecting bar at the end of which is an operating lever and handle. The slats are preferably "stream-line" in cross-section, and each slat consists of a bar of "stream-line" cross-section, to which is riveted a thin metal plate. When the shutter is closed the end of one slat engages with the adjacent slat, and makes an airtight connection with it.

(8) Exhaustive tests have been carried out which prove that the air pressure in the boiler room equals the total pressure exerted by the fan less the amount of suction at the fan inlet. Further tests on board ship show that of the total air pressure which the fan installation is able to maintain at maximum output fully one-third is wasted in losses of flow through the intake shaft, making only two-thirds available for the boiler room. It would be desirable to specify fans designed for increased air pressures, beyond that which is necessary for smokeless combustion, instead of increased quantities. By this means there would be a reserve of pressure to overcome resistances in intake passages if they occur. At the same time a greater supply of air to meet emergency conditions would still be available.

(9) From the many steam consumption tests which have been made from time to time on various sizes of fans and engines, it may be taken that the increase in the steam consumption of fan installations is about 20 per cent. due to 1 in. vacuum on the inlet.

(10) The performance of a fan is considerably improved in the output as well as efficiency if attention is given to the design of the fan casing, and to the discharge of the air from the fan case. Fan casings should be constructed as a volute form, designed specially to suit the exact conditions for each ship. Tests, carried out on various sizes of fans, illustrate the importance of correct design of casing.

(11) When several fans are placed side by side it is found that some of the air delivered from one fan obstructs the delivery of air from an adjacent fan. This objection is overcome by the employment of guides or deflectors of special form. Deflectors should always be arranged so as to guide the streams of air in a correct and natural path, and fitted as close as possible to the periphery of the fan impeller, only allowing a running clearance of about 1 in. Recent observations have demonstrated the value of long deflector plates as compared with short ones, and where there is room for them it is desirable to have long plates, so as to deflect the streams of air gradually, and also to act as a guide for a greater distance.

(12) The furnaces of the boilers placed amidships are plentifully supplied with air, whilst the furnaces situate at the wings do not get such a direct and ample air supply. Considerable improvements in this direction can often be achieved by regrouping the fans and reversing the direction of rotation of the fans, thereby obtaining a uniform supply over the whole width of the boiler room.

(13) To arrive at the amount of air required in practice the theoretical amount must be multiplied by a factor which is usually found to be within the range of 1.6 to 2.5, that is to say, the volume of air as measured at normal atmospheric temperature and pressure required for the combustion of 1 lb. of oil fuel is from 250 to 450 cubic feet.

(14) In the latest ships, considerations of weight and space, and also of efficiency in working, have become of such vital importance that increasing investigation has been devoted to obtain the maximum output possible with a fan installation of minimum weight and space, absorbing as little power as possible for a specified duty. With the ever-increasing air pressures, and consequent greater air

velocities through the fan vanes, together with the large volumes to be dealt with, in order to achieve a maximum all-round efficiency, great attention has to be given to the design of the vanes of modern fans, so as to make the air streams passing through them follow as closely as practical limitations will allow the laws of dynamics with due consideration of the physical properties of the medium one has to deal with.

DISCUSSION.

Mr. Harold Yarrow commented on the fact that Mr. Allen's firm had carried out experimental work which had cost a great deal of money and had rendered a service to the profession by making the results public. He was inclined to hope that the position after the war would bring out the spirit of co-operation which had been exhibited by Major Allen and that there would be a free exchange of idea and experience. His own firm had looked into the subject discussed in the paper several years ago in connection with fans for destroyers. It appeared to them that the turbine lent itself admirably to driving a fan for forced draught, and as the result of experiments carried out in conjunction with Terry & Co., an American firm, a large number of turbine fans had been fitted in high speed boats with great success. The fan and turbine were arranged right up underneath the main deck, which was a great advantage, as the air could come directly over the fan, avoiding the losses which would otherwise occur. Another point was that the air supply was delivered high up, and by the time it reached the burners was fairly well distributed over the stokehold. The one objection made to this arrangement and to the fan design generally was on account of the noise it made and only on military grounds was that found not to hold. He would like Mr. Allen to give them the benefit of his opinion on turbine driven fans.

Mr. J. Hamilton Gibson, speaking from knowledge of what had been achieved by the Allen system under test, said he was quite satisfied that what was stated on this subject was substantially correct. His firm, Cammell Laird, were among the first to realise the advantages of the design got out by Mr. Allen, and had gone very fully into the system for vessels now building. Air inlets should of course be free, there should not be any sudden change of area in the ducts, and eddies should be avoided. Too often, however, the air supply had to give way to other arrangements which were regarded as being more important, but, of course, most things on shipboard were a series of compromises, and they had to be content with the best which could be done in connection with air supply. Mr. Allen's work on the subject had taught them much, and in cases of trouble in future they would know where to look for the cause and the remedy. It should be possible to arrive at the minimum space and weight, not only in fan and engines, in the dimension of cowls and upper deck obstructions, but the air trunks themselves were of very great importance in the larger classes of ships.

Mr. W. H. Allen reminded the meeting that it was 34 years since Mr. Howden had read his classic paper on forced draught. His own firm had commenced the manufacture of forced draught machinery about the same time, the year 1884, and in the early days carried out a number of experiments for the Admiralty. He believed those experiments laid the foundation of the knowledge possessed to-day. It was no good making fans and engines of correct design if they were not properly fitted into the ship, and hence the system described in the paper by which he believed they had secured the efficient working of the installation on shipboard. In oil fuel boats it was most important to have the right quantity of air delivered to the boiler room. He regarded the paper, which was entirely the work of his son, as leading a revolution in the details of ships' fittings. There were other directions in which scientific methods could be introduced with great benefit to the mercantile marine.

Mr. R. W. Allen, in a brief reply to the discussion, said there was a fashion in machinery, and the tendency to-day was in favour of the steam turbine, preferably of the gear driven type. That being the case in the main machinery, most of the auxiliary plant would probably be turbine driven. He believed for that reason, if for no other, that the turbine fan was going to be more generally adopted. Marine engineers had shown much interest in the proposals made with regard to an improvement in the air supply to boiler rooms, and as standardisation was the order of the day, perhaps it would be possible to get the arrangements of these installations standardised on sound lines. At the present time no two shipyards adopted the same design for fan arrangements, but it ought to be a simple matter to use identical designs for vessels in the same class. He had not made any experiments with radial slats, and the present arrangements were the best of many designs which had been tested.

The meeting then concluded.

GENERAL NEWS SECTION.

PERSONAL.

Monsieur George Depastas, the new Consul for Greece at Cardiff, has taken up his duties at that city.

Mr. Charles Cooper, of Cardiff, Lloyd's surveyor, who died on November 16, left personal estate in the United Kingdom valued at £3,949.

M. de Pellerin de Latouche has been elected chairman of the Compagnie Générale Transatlantique, in succession to M. Jules Charles-Roux.

Lieutenant John Elliot Seager, eldest son of Sir William Seager, shipowner, Cardiff, has been severely wounded. Prior to the war he was a director in the firm of W. H. Seager & Co., Ltd.

The *Pioneer Mail* (India) states that Lieutenant-Colonel J. MacGregor, R.E., has been appointed Controller of Shipbuilding under the Indian Munitions Board as from December 8 last.

Captain Malcolm Alfred Laing, an underwriting member of Lloyd's since 1878, whose death occurred on December 10, 1917, left estate valued at £52,216. He was Lord Lieutenant of Orkney and Shetland since 1892.

Mr. R. M. Sutton has succeeded Mr. J. W. Witherington as chairman of the North of England Steamship Owners' Association. He is a son of the late Alderman Sutton, and a member of the ship-owning firm of Stephens, Sutton & Stephens.

The Liverpool Shipwreck and Humane Society have awarded an illuminated address to Captain C. H. Christian, master of the Pacific Steam Navigation Company's steamer *Victoria*, in recognition of the humanity displayed by him and his crew in rescuing the crew of the torpedoed French barque *Persévérance* on September 25 last.

On the recommendation of the President of the Board of Trade, the King has been pleased to make a posthumous award of the Silver Medal for Gallantry in Saving Life at Sea in the case of Mr. Robert McBurnie, formerly a chief officer in the mercantile marine, in recognition of his gallantry in attempting to save life at sea.

The death recently occurred of Mr. William Jenkinson, senior partner in the firm of Brown, Jenkinson & Co., shipbrokers, of 4, Lloyd's Avenue, London, E.C. Mr. Jenkinson was a native of Yorkshire, and was 74 years of age. He was at one time a member of the Room Committee of the London Shipping Exchange, and had been a member of the Baltic Mercantile and Shipping Exchange for upwards of 40 years.

Second Lieutenant Lawrence Forbes, whose death occurred from wounds received in action on July 9, 1917, left estate valued at £19,694, with net personalty £19,639. The deceased gentleman had been an underwriting member of Lloyd's since 1903, and he has left the residue of his property on the death of his mother as to 15 per cent. for marine charities, of which not less than one-eighth is for Lloyd's Patriotic Fund.

The Liverpool Shipwreck and Humane Society have supplemented the gifts already made to the officers and crew of the steamer *New Pioneer* for the rescue work they performed during the sinking of the steamer *Cork* on January 26, by presenting to Captain J. T. M. Gimmell a silver medal, binoculars, and illuminated framed certificate of thanks, and to the second officer, Mr. George Healey, a silver medal and framed certificate of thanks.

On the occasion of his retirement from the position of Superintendent Engineer to the Cork Steamship Company, Ltd., Mr. J. A. Flockhart, M.I.N.A., M.I.M.E., has been presented by his colleagues with a number of valuable gifts, also a diamond ring has been presented to Mrs. Flockhart. Mr. Flockhart entered the Cork Steamship Company's service in 1877, and for the last 20 years has been marine superintendent of the company.

The funeral took place last week of Captain John Keay, formerly the Marine Superintendent of the Hall Line and afterwards of the Beaver Line. He was in his 90th year, was a member of the executive council of the Mercantile Marine Service Association, and in past years filled the positions of vice-president and president of that body. In his early sea career he commanded the fleetest of clipper sailing ships, and attained the dignity of master at the early age of 22.

Mr. T. J. Callaghan, chairman of L. Gueret, Ltd., has been nominated as President of the Cardiff Chamber of Commerce in the place of Sir T. E. Watson, Bart., who did not seek re-election. The new Vice-Presidents are Mr. R. O. Sanderson and Mr. W. R. Hann. Nine candidates are nominated for the five vacancies on the Council: Sir Wm. Seager, Mr. W. H. Renwick, Mr. J. A. Jones, Reginald N. Jones, Daniel Radcliffe, J. C. Gould, Lewis Lougher, Frank Fifoot, and J. P. Cadogan.

The death took place recently of Mr. Ralph Erskine Langlands, director of the Liverpool Shipping Company (M. Langlands & Sons). The deceased gentleman, who was 53 years of age, was a son of the late Mr. John Langlands, of Glasgow, and was a grandson of the founder of the firm. Mr. Langlands had been associated with the Liverpool office of the firm for some 25 years, and was an ex-chairman of the Coastwise and Short Sea Section of the Liverpool Steamship Owners' Association.

The death occurred on March 19 of Mr. Walter Charles Reeder, at the age of 72 years. He was a Director of W. C. Reeder & Co., Ltd., of Britannia Dry Dock, Millwall, and 65, Fenchurch Street, London, E.C. Mr. Reeder had been associated with the dry dock business on the Thames for over 58 years, having served his apprenticeship with Mr. Walker, at Deptford Green, where some of the fast China clippers were built. He had been a member of the Institution of Naval Architects since 1894.

The following are the new members of the Cardiff Institute of Shipbrokers: Wm. Blow (Wm. Blow); John Tierney (M. J. Begg & Co.); Herbert H. James (Henry R. James & Sons, Bristol); W. T. McCann (Bethel, Gwyn & Co.); A. H. Gunn and George Prior (Sir John Gunn & Co., Ltd.); C. H. Kestell (Kestell Bros.); R. P. Owen (Létricheux & David, Ltd.); W. P. Miles (Morgan, Wakley & Co., Ltd.); John Moore (John Moore & Co.); M. Smith-Petersen (Smith-Petersen & Co., Ltd.); and John Tyrrell (John Tyrrell).

Mr. Frank Workman, D.L., partner in the firm of Workman, Clark & Co., Ltd., in forwarding a cheque for £1,000 to the Ulster Volunteer Force Hospital for wounded soldiers (Extension Fund) said he pleaded guilty to having held the opinion at one time that hospitals such as this should be provided by the State alone; but from what he had seen lately of State interference, he had no hesitation in saying that no State-run institution would have a chance as regards efficiency and economy with one run on the lines of this hospital.

The Imperial Merchant Service Guild have re-elected Captain J. W. Grace as chairman for another year. As this is Captain Grace's third year of office, his re-election is evidence of the confidence reposed in him by the Committee and members, and of

satisfaction at the efficient manner in which he has presided over the affairs of the Guild, of which he is one of the original members. Captain A. W. C. Jackman, who has been elected Vice-Chairman, for many years held command in the Prince Lane, and he also has for long been closely identified with the Guild's aims and aspirations.

The death has occurred of Mr. J. W. Kernan, who for over 33 years was connected with the cross-channel services of the London & South Western Railway Company. He made many thousands of crossings, and had commanded nearly every vessel in the company's fleet. In 1902 Mr. Kernan effected the rescue of a number of men of the French schooner *St. Marcouf*, which foundered while being taken in tow. His services were handsomely recognised by the French Government. In 1903 he gained the recognition of the French Ministry of Marine and the British Shipwrecked Mariners' Society for saving the crew of a French pilot vessel. He retired at the age of 60 years, but returned to duty after six years, and worked for 11 months on a hospital ship.

FROM OUR CORRESPONDENTS.

CLYDE DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

Clyde Shipyard Holiday.—Easter Monday was observed as a holiday in the Clyde area except in the case of munition workers, who, in response to the appeal of the Minister of Munitions, remained at work. It was at first thought that Mr. Churchill's appeal was intended to include the shipyards and engineering establishments, but an authoritative statement on the point was made in time to save any confusion. It is now recognised by those responsible for the direction of shipyard labour on the Clyde that very little is to be gained by interfering with the normal arrangements in respect of holidays, especially in an industry such as shipbuilding where the men have been working at high pressure for so long a period.

Ayr Harbour Transfer.—The proposal to transfer the harbour undertaking of Ayr from the Harbour Trustees to the Glasgow and South-Western Railway Company, if carried into effect, will probably have an important bearing on the future development of the port. The negotiations in connection with the scheme appear to be well advanced. Notice has been given that the railway company intend to promote a Provisional Order in the course of the next session of Parliament. This Order will empower them, among other things, to acquire the harbour and its equipment on such conditions as may be agreed upon, to authorise the company to exercise all the rights and privileges of the Harbour Trustees with regard to the working of the harbour, and to transfer to the company all the engagements and obligations of the Trustees. Provision will also be made for the dissolution of the Harbour Trust and the winding up of its affairs. The petition and a draft of the proposed Order will be lodged with the Secretary for Scotland in the course of a fortnight.

Clyde Engineers' Loyalty.—That the great bulk of the Clyde workers solidly support the Government in their man-power proposals is evident from the statement issued last week by Mr. A. Carr, ex-chairman of the Glasgow District Committee of the Amalgamated Society of Engineers. The statement relates to the decision come to at a number of meetings held in connection with the society in Glasgow for the purpose of hearing reports from the delegates who attended the recent "unofficial conference of national representatives from the workshops throughout the United Kingdom." At each of the Glasgow meetings following on that conference, resolutions were passed disapproving of the Government's proposals with respect to man-power. Referring to this decision, Mr. Carr says it would be a great mistake to assume that the meetings referred to represented the membership of the society within the areas in which they were held. There are about 17,000 members of the A.S.E. in Glasgow and the aggregate attendance at the five meetings in question might be from 1,200 to 1,400. As one of the delegates to the conference, he attended all the five local meetings and gave in his report. He and the other delegates recommended acceptance of the Government's proposals, and he wished it to be clearly understood that the executive council had no responsibility for the action taken by those who carried the resolution.

SCOTTISH EAST COAST DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

Leith Sailors' Home.—The 33rd annual report of Leith Sailors' Home records a satisfactory year's progress. Large numbers of naval men had made use of the Home. During the year 375 shipwrecked, sick or destitute seamen had been lodged. Of these 77 were British, 151 Danish, 65 Norwegian, 41 Swedish, 24 Dutch, 7 Spanish, 5 Russian, 4 Japanese, and 1 Italian.

Arbroath Harbour Finances.—A meeting of Arbroath Harbour Trustees and creditors of the harbour undertaking was held last week to consider the financial position in which the trustees have been placed on account of the decline in the shipping trade of the port as the result of the war. Representatives were present from the town council of Arbroath, who are among the largest creditors, and also from the guaranteed and ordinary stockholders. After discussion a joint committee representative of all parties interested was appointed to consider the whole position and to make arrangements if possible for the carrying on of the harbour.

Leith Dock Extension Scheme.—Leith Dock Commissioners have given notice that they intend to apply to Parliament for powers to make a number of extensions on the docks and harbour of the port and to carry out certain improvements on the existing docks. The new works include the construction of a breakwater or reclamation wall on the western side of the harbour and docks, commencing at or near the western end of the north pier at Newhaven and extending in a northerly direction (seawards) for a distance of 1,050 ft., and thence in a north-easterly direction for a distance of 2,940 ft. The proposed wall will terminate about 900 ft. from the seaward end of the West Pier of Leith. It is intended to fill up some part of the area to be enclosed. The draft of the Order provides for a number of other extensions, including the reclamation of portions of the foreshore with a view to adding the reclaimed areas to the quay space. The Commissioners intend to proceed with their application for these powers by way of Provisional Order. The promotion of this new measure by the Commissioners has given rise to some comment locally in view of the fact that prior to the outbreak of the war they had expended a good deal of time and expense on a scheme of a similar kind.

NORTH EAST COAST DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

Business Men's Congratulations.—Nowhere on Tyneside was the magnificent stand of the British troops against the German onslaught in France more profoundly appreciated than among the business men on the Commercial Exchange. On the eve of the Easter recess, they met together and sent a message of congratulation to Sir Douglas Haig, assuring him of their unabated confidence in the men at the Front, and their admiration of their gallant and determined efforts under his leadership. Short speeches were delivered by Mr. A. Munroe Sutherland, Mr. J. E. Tully, and Mr. George Renwick, and warm tributes were paid to the troops and to the men of the navy and the mercantile marine.

The Easter Holiday.—The exigencies of national requirements made a marked difference to the Easter holidays on Tyneside. The shipyards and engine shops were closed from the Thursday night to Tuesday morning, but the munition factories worked as usual, there being a very cheerful response on the part of both men and women to the appeal of the Minister of Munitions to forgo the Easter vacation in order that the output of guns and shells might not be interrupted. The critical stage reached in the great conflict on the Western Front completely subdued the usual holiday feeling, and therefore there were in the aggregate many more men at work on Good Friday and Easter Monday than there were idle.

Advances to Workmen.—The shipbuilding employers and the representatives of the shipyard trades on the Wear get along all together very agreeably, and thus labour troubles on that river are not often heard of. A conference has been held between the Wear Shipbuilders' Association and representatives of the Wear, Tees, and Hartlepool districts of the Shipwrights' Society, relating to the advances granted by the Admiralty and the Committee on Production in December, 1917, and in February of this year respectively, and a question discussed was as to how these advances should be applied to workmen where the method of payment possessed some peculiarities. The Shipyard Labour Department

supplied interpretations on certain points raised, and agreement was arrived at by the conference regarding the allocation of the increases.

Tyne Lifeboat Trust.—When Sir Godfrey Baring, M.P., deputy chairman of the Royal National Lifeboat Institution, lately attended the annual meeting of the South Shields Branch of the organisation he visited a town on the North-East Coast where the lifeboatmen have always showed a preference for the boats of the Tyne Lifeboat Trust to those of the Royal National Institution. The local people are, nevertheless, very warm supporters of the latter. South Shields was the birthplace of the lifeboat, and this may account for its long attachment to the Tyne Lifeboat Society. Very few men in this country can lay claim to a longer connection with life-saving work than Mr. Samuel Malcolm, who is president of the Tyne Lifeboat Society, and also of the South Shields Volunteer Life Brigade. He was one of the founders of the life brigade 53 years ago, and is now probably the only survivor of the Shields men who established that beneficent agency very shortly after the pioneer Volunteer Life Brigade at Tynemouth had been formed in 1864. Before the Tyne Piers were completed and the port had been made a safe harbour of refuge, shipping casualties were common at Shields almost every winter. Mr. Malcolm can recall having seen in his earlier days upwards of 30 wrecks at the entrance to the Tyne after a single severe gale.

THE MERSEY DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

Cold Storage.—A very useful provision is to be made at the North Dock in the form of increased cold storage accommodation. The Mersey Docks and Harbour Board have granted the application of the Union Cold Storage Company for the erection of a cold storage at the Alexandra No. 3 Dock, and it has been decided that four sections of the shed at the east end of this dock be let to the company named for the purpose stated.

Dockers' Pay.—The Committee on Production has issued its award on the Liverpool dockers' demand for a whole day's pay for working up to 1 p.m. on Saturdays, and double pay on the present war wage for Sunday work. The first claim is dismissed, and the second granted. This decision brought about a temporary stoppage of men at certain docks last week, because their main demand for an increase in the rate of pay per hour was held over to be considered with the national claim of transport workers for a minimum increase of 8d. per hour on all pre-war rates. In the end, they were induced to return to work, and allow their demand to be dealt with along with the national application.

Transport Workers' Battalions.—Sir Norman Hill, who is chairman of the Port and Transit Executive Committee, says that he is in agreement with the recommendation of the Select Committee on National Expenditure that the employment of Transport Workers' Battalions should be increased, but to obtain our overseas supplies we must have at all times the services of some 120,000 civilian transport workers in the ports, for the great bulk of the work has been done, and must continue to be done, by the expert civilian transport workers. To those workers the nation is under a deep debt of gratitude. While the battalions are limited in number, and are only intended to meet the extraordinary and fluctuating demands for labour which war conditions create, Sir Norman says he is certain that they will be the first to wish credit given to the expert civilian transport workers who have played the greater part in securing the more rapid clearance of the ships in our ports.

Shipbrokers' Loss of Business.—A number of Liverpool shipbrokers are feeling some concern about the loss of business they have sustained through the alleged action of the Government in giving consignments to the regular liners, which, in the ordinary course of business, would have been attended to by the brokers, and it is felt that this is a question which should be taken up on their behalf by the Liverpool Shipbrokers' Association. One such is concerned about firms who have been given the "management" and "fixing" of a large number of boats to the detriment of the others who have had their living taken away, and further, that there is information of a most valuable nature, which the favoured firms have obtained, which "will be used after the war to stifle out the small man." It is hoped that Sir J. Maclay will be made to see that his Department has been guilty of a grave injustice to the shipbrokers, who, incidentally, have been useful to him in the past.

Representations on these lines have been made to Mr. Alfred Coker, Jun., the honorary secretary and treasurer of the Liverpool Shipbrokers' Association, and that gentleman has asked that brokers who are sustaining loss of business in this way should send to him returns showing the number of consignments each firm received in the three years before the outbreak of the war, and also a corresponding return for 1915, 1916, and 1917, and he will prepare a statement on them for the consideration of his Committee.

SOUTH WALES DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

The Brokerage Question.—The Newport Chamber of Commerce have added their support to the protest which is being made against the Coal Controller's Order to transfer the usual coal exporter's one-third brokerage from the coal exporters to the colliery owners. The Chamber also decided to request representation on the local committee of the Coal Licensing Committee. On this body Monmouthshire coalowners are represented, but the shipowners and coal exporters are not.

Cardiff Naval Brigade.—An appeal was made to the members of the Cardiff Chamber of Commerce by the retiring president (Sir T. E. Watson, Bart.) on behalf of the Cardiff Naval Brigade, which had been formed and trained by Commander Schofield. The brigade, which is the strongest in the country, had a membership of 200. Over 150 members had passed into the Services of the country. The Government, while accepting their services and willing to give them a status, did not give any financial help. An appeal was made for £500, and Sir T. E. Watson and Sir W. H. Seager promised to start this fund with £25 each.

Dry Dock Staffs' Association.—As the result of a meeting of the staffs of dry docks in the Bristol Channel, presided over by Mr. L. Jenkins (Bute Dry Docks), it has been decided to form "The Shipbuilding, Engineering, and Steel Trade Commercial Staffs' Association, Bristol Channel Centre." Mr. W. Sutherland (Tredegar Dry Dock, Newport) was elected president, Mr. Leo Jenkins (Bute Dry Docks) and Mr. W. McKenzie (Tredegar Dry Dock, Newport) vice-presidents, Mr. W. Welsh (Barry Graving Dock) treasurer, and Mr. Dan Jones (Hill's Dry Dock) secretary *pro tem*. Bristol, Avonmouth, Newport, Cardiff, Barry, Penarth, Port Talbot and Swansea were represented. The association, which has received the approval of the employers' association, will consider the desirability of affiliating with the national body.

Chamber of Commerce and State Control.—The retiring President of the Cardiff Chamber of Commerce (Sir T. E. Watson, Bart.), in referring to the work of the Chamber in the past year, said that many important matters had been dealt with. As showing the difficulties under which business men laboured to-day he said that the Orders issued by different Controllers were about 120 in number, all of which shipowners and coal exporters were expected to know and obey. They had opposed the Government proposals to continue the control of trade for three years after the war. In regard to shipowners, Sir Thomas said the vessels were being taken by the Government, who charged high freights for the carriage of commodities; while the shipowner had only 6s. 6d. per ton, the Government charged the consignee £6 or £7 for the same voyage.

THE FREIGHT MARKETS.

(FROM OUR OWN CORRESPONDENTS.)

London.—Chartering conditions on the Baltic Exchange were without material change. Available tonnage is eagerly snapped up and rates remain high. Homewards from the River Plate figures are still on the basis of 200s. to this country and 205s. to France, while good rates offer for both steam and sailing vessels to the United States. On the North American Atlantic seaboard charterers are seeking tonnage on net form of charter at 230s. to the United Kingdom, 270s. to France, 350s. to 360s. to French Mediterranean ports and up to about 375s. to Italy. For Gulf loading 30s. more can be obtained. Rates for heavy grain stand at 50s. to the United Kingdom, 57s. 6d. to France, 75s. to Marseilles, and 77s. 6d. to West Italy. Coal cargoes from Virginia to the Plate can be had at 80s., and general cargoes offer to South America at full rates. For sugar, Cuba to France, 305s. would be paid. The Eastern section of the market maintains a very firm tone, 250s. offering on scale basis from Karachi to this country, 275s.

on d.w. to the same destination from Bombay, and 400s. to the Mediterranean. From the Madras Coast kernel cargoes offer at 550s. to Marseilles. The rice ports are competing for tonnage, Burnah being worth fully 500s. to the United Kingdom and Saigon 550s. to France. Australia would pay 130s. to the United States. Salt cargoes could be booked at 52s. 6d. from Torreveja and 45s. from Port Said to Calcutta. The Mediterranean ore and phosphate ports are chartering on the basis of 45s. Huelva to the Mersey, 60s. Huelva to the East Coast United Kingdom; for pyrites, 50s. Bougie to the Clyde, and 65s. Tunis to the same destination. 80 fr. Sfax to Rouen, and 50s. Bilbao to Boulogne. Bay business is indicated by fixtures at 17s. Bordeaux and 20s. Bayonne to the Bristol Channel.

Glasgow. Business has been interrupted to some extent by the holidays, but the small amount of tonnage offered would, in any case, have kept conditions very quiet. As a rule both outward and homeward markets have been inactive, but rates were firm. The fixtures reported included: Bordeaux, 2,200; Bristol Channel, 17s. prompt; steamer fixed on time charter, States and West Indies, 35s., one round trip, delivery, States; and New York to Liverpool, 230s.

Newcastle-upon-Tyne.—There is a better supply of official tonnage available for the shipment by Northumberland and Durham collieries of requisitioned coals at present than has been the case for a very long time past and the mining industry is correspondingly active. Apart from the movement of coal on Government and Allied account, however, there is very little doing, by reason of the continued shortage of "free" vessels on offer. The only business done in the open chartering market during the week under review has been from Scandinavia, in which direction vessels of, respectively, 1,250, 2,000 and 2,200 tons have been taken up from Christiania at 150 kr., a 1,500-tonner from Dronheim at 140 kr., a 2,800-ton steamer from Gothenburg at 160 kr., and two vessels, 1,050 and 1,650 tons, respectively, from the same port at 165 kr. The Norwegian rates are steady when compared with recent similar business; the Swedish business is rather firmer. Coasting business is still at a standstill. Rates in other directions are nominally unaltered at the following typical rates: Bilbao or Santander, 300s. to 310s.; Lisbon, 115s.; Oporto, 125s.; Huelva, 420s.; Gibraltar, 100s.; Port Said, 200s.; and Barcelona, 440s.

Liverpool.—Outward freights on this market continue firm, and despite the holidays, orders at the coal ports continue to come in very much in excess of the tonnage offering, and in some instances neutrals are offering advanced rates to get supplies. Business going through is, however, limited to free tonnage coming on the market, and this being much below the daily requirements, orders are left to accumulate. Time chartering is subject to the same conditions, and any available boats could be quickly taken up at full rates, namely, 35s. to 40s. in the United States control trades and up to 50s. in the European trade for neutrals. Homeward freights are firm all round, but little business can be done with tonnage unobtainable. North America, the most active market, is unable to fill orders, though a limited business is going through in net charters on basis of 230s. to United Kingdom, 260s. to French Atlantic, 330s. to Marseilles, 360s. to Genoa, and 400s. is indicated from Gulf to Genoa. Grain rates are firm at 50s. from Range to United Kingdom and 77s. 6d. to 80s. to West Italy. Eastern markets are quiet, and firm rates fail to bring much needed tonnage. River Plate dull, on basis of 200s. to United Kingdom, and \$20 to United States.

Cardiff and Swansea.—There has been but little alteration in the conditions of the market. Tonnage for the authorities was at times in better supply, but practically no free vessels are available. High rates continue to be offered for neutral destinations, but no business was reported. The bulk of the business concluded was again for France. The following fixtures were disclosed: Havre, 47s. 3d. (neutral); Bordeaux, 34s. (allied); Nantes, 61s. 6d. (neutral). A small sailing vessel was chartered for Morlaix at 106s. 3d. Gibraltar was again done at 100s. A steamer was fixed for Youghal at 20s. On the Swansea market chartering was on restricted lines. The demand continues active, but actual business shows no expansion. Transactions reported were entirely for French ports, viz.: Havre, 45s. 9d.; Dieppe, 48s. 9d.; Rouen, at 47s. 3d. and 48s. 9d.; and Llanely to Rouen, at 50s. 3d. Neutral vessels were employed in each case.

Hull.—The market has remained fully firm over Easter and has not yet recovered from the effects of the stoppage at the pits.

Tonnage for all destinations is scarce on the re-opening of the market, especially for West Italian ports. There is a particularly keen inquiry for the North French trades and tonnage of any size is eagerly snapped up for this branch. The Scandinavian market is quiet as tonnage is extremely difficult to get for neutralwise traffic.

THE COAL MARKETS.

(FROM OUR OWN CORRESPONDENT.)

The better tone recently noted in connection with the coal trade generally throughout the country is being maintained. Inland the markets are as brisk as ever, and at the principal coal exporting ports of the North East Coast, South Wales and Scotland, operators have little reason to complain, having regard to the restrictions which are placed on the coal trade. The weakest markets are still those of South Wales, where, although an improvement has certainly been shown in the last week or two, business is still sluggish. New transactions are rather conspicuous by their absence and but little interest has been shown in the markets.

The bunker coal trade has shown a little more activity. At the North-East Coast ports a good amount of shipping has shown up, and this, together with a large amount of fuel requisitioned for official purposes, has resulted in an improvement in the bunker coal position. Nearly all the bunker coal produced is being absorbed and prices are fairly firm at 24s. to 27s. 6d. Specials are quoted nominally at 30s. for export, but actually command a few shillings above this figure. At the South Wales ports there is a demand for bunker smalls of the best description, but inferior qualities are dull and sluggish in movement. Prices range from 20s. 6d. to 24s.

A fairly active demand has prevailed on the North Country coal markets during the last week or two. A good amount of tonnage has been on hand and the collieries have therefore been able to dispose of their outputs without difficulty. Indeed, there has been rather a pressure for deliveries. All classes of steam coal are in request, especially bests, and most of the collieries are fully booked up for a week or two ahead. Small steams, however, continue to move off rather slowly.

Durham coals have been enjoying a period of comparative prosperity. Gas coals are freely inquired for, bunkers are in a good position, and house coals are taken up to the extent of the full outputs of the collieries.

Prices are approximately for best Blyth steams, 30s. to 32s. 6d.; and smalls, 18s. 6d. to 20s. 6d.; Tyne primes, 29s. 6d. to 32s.; and smalls, 25s. to 27s. 6d.; second steams, 25s. 6d. to 29s. 6d.; and smalls 18s. 6d. to 20s. 6d.; unscreened steams, 24s. to 25s.; North Northumberland steams, 28s., and smalls, 20s.; smithies, 25s. to 30s.; nuts, 32s. 6d. to 33s. 6d.; Durham gas coals, 23s. 6d. to 30s.; coking coals, 17s. to 25s.; house coal, 20s. to 22s. 6d.; bunker coal, 24s. to 27s. 6d., and specials, 30s.; foundry coke, 42s. 6d. to 45s.; and blast furnace coke, 35s. 6d.

In view of the lack of new business the South Wales coal markets are in no animated condition, but the amount of fuel which goes forward on contract account is pretty large and the trade is, therefore, steady. There has been a better show of shipping at the South Wales ports lately and this has permitted of a greater movement of fuel. As a result most of the collieries, especially those producing smokeless fuel and good quality steam coal, are fully employed. The strong home demand, also, absorbs the major portion of the bituminous fuel, and only smalls are in a really weak position. Stocks of smalls are still too large, although the best quality smalls are being better taken up for bunkers. There exists a very good demand for coke and patent fuel and top prices are being realised.

Approximate prices are for best quality steam coal, 35s. 6d.; seconds, 33s. 3d. to 34s.; ordinary steams, 32s. 6d.; drys, 31s. to 32s. 6d.; steam smalls, 20s. 6d. to 25s.; best large Black Veins, 32s. 6d.; Western Valleys, 31s. 6d.; Eastern Valleys, 30s. 6d. to 31s. 6d.; nuts, 30s. 6d. to 32s. 6d.; duff, 16s. 6d. to 20s. 6d.; house coal, 33s. 3d. to 35s. 6d.; No. 3 Rhonddas, large, 33s. 3d., and smalls, 28s. 6d.; No. 2 Rhonddas, large, 29s. 6d., and smalls, 19s. 6d. to 21s. 6d.; through and through coal, 24s. 6d. to 26s.; gas coal, 27s. 6d.; and patent fuel, 32s. 6d.

The Scottish coal markets are still animated by a vigorous tone due to the steady absorption of the colliery outputs. As a matter of fact, the demand is rather greater than the pits are able to meet, and prices are consequently kept quite firm. It is true that exports do not amount to much, but official requirements and the home

demand are practically sufficient to keep the pits going, more especially in the West of Scotland. Fifeshire and the Lothians also continue to experience a brisk demand.

Quotations are, with the addition of 2s. 6d. per ton coal wage increase, for splint coal, 28s. to 30s.; Hartleys, 29s.; Ells, 26s. 6d. to 28s.; screened Navigations, 28s. to 30s.; unscreened Navigations, 25s. 6d. to 29s.; steam coal, 27s. 6d.; and nuts, 21s. to 23s.

The Hull coal market is without material alteration. For all classes of steam coal the demand is strongly maintained and practically the major portion of the coal coming on the market is taken for official requirements or for export to allied destinations. Inland the requirements are as pressing as ever and nuts particularly are in request.

Prices rule round about 32s. 6d. for screened steams, 30s. for Hartleys, 30s. for Yorkshire steam coal, 27s. 6d. to 28s. 6d. for gas coal; house coal and cobbles, 30s.; nuts, 25s. 6d. to 27s. 6d.; and smalls, 22s. 6d. to 23s. 6d.

So far as the Midland coal markets are concerned the position remains unchanged. The Easter holidays caused the demand to increase last week, but as the pits were all working at full pressure this was, in many cases, not met. For manufacturing purposes there is a real scarcity of fuel, though munition works are kept adequately supplied.

On the London market the summer-like weather had a perceptible effect in reducing trade, but the changed atmospheric conditions have once again caused operations to become brisk. Good supplies of fuel continue to reach the metropolis, but all coal which comes on to the market is readily taken up.

COMPANY REPORTS AND DIVIDENDS.

Cairn Line of Steamships, Limited. The directors announce an interim dividend of 5 per cent., free of income tax. Last year 2½ per cent. was paid.

H. & C. Grayson, Ltd.—The directors announce an interim dividend of 6d. per share, less income tax, on the preference shares payable April 17, to shareholders on the register at April 3.

R. & W. Hawthorn, Leslie & Co., Ltd.—The directors announce an interim dividend of 5 per cent. per annum, free of income tax, on the ordinary shares. Last year the same dividend was paid.

Cammell, Laird & Co., Ltd.—The directors recommend final dividends for the year 1917 of 2s. 6d. per share (2½ per cent.) on the preference shares and 7s. 6d. (7½ per cent.) on the ordinary shares, less income tax, making a full dividend of 5 per cent. on the preference and 10 per cent. on the ordinary. The sum of £150,000 is put to reserve and £74,689 is carried forward.

Smith's Dock Company, Ltd.—The report of the directors states that the profit for the past year, after providing for depreciation and interest on debenture stock, amounts to £183,890. To this has been added £40,910 brought forward from previous year, making a total of £224,800. Out of this amount there is provision for 5 per cent. dividend on preference shares and 15 per cent. on ordinary shares. The sum of £60,000 has been placed to reserve, and balance of £54,800 carried forward.

Northern Maritime Insurance Company, Ltd.—The report for the year ended December 31, 1917, shows a credit balance of £18,964. The profit and loss account, with this addition, amounts to £68,624 after transferring £1,500 to investment fluctuation account and after payment of an interim dividend of 10 per cent. A final dividend of 15 per cent. on the paid-up capital, free of income tax, was paid on March 1. That payment amounted to £4,500, leaving a balance of £64,124 to credit of profit and loss and revenue accounts, in addition to balance of £1,441 to the credit of investment fluctuation account.

Union Marine Insurance Company, Ltd.—The report for 1917 states that the balance of underwriting account for 1916 was £792,123. Payments during the past year amounted to £497,630 and £100,000 has been transferred to underwriting suspense account to meet unsettled claims, leaving an underwriting profit of £194,492. Interest received on investments, &c., less tax, amounts to £62,007. The balance of profit and loss for 1916 was £355,351, from which a dividend of £35,970 was paid in April last. The statement now submitted, after deducting interim dividend, writing £38,000 off investments, and making provision for special taxes, shows a credit balance of £386,129. The directors recommend a further dividend

of 13s. 6d. per share, free of tax, making a distribution of 20s. per share for the year. Premiums received, less returns, reinsurances, &c., amount to £2,371,565, and claims settled to £929,841.

Lampport & Holt, Ltd.—The report of the directors for the year ended December 31, 1917, states that the profit, after providing for depreciation, amounts to £232,689, to which must be added £80,260 brought forward from 1916, making a total of £312,949. The Board have placed £50,000 to reserve (bringing that account up to £600,000), £50,000 to insurance account, £10,000 to staff fund, and after payment of dividend on preference shares they recommend a dividend on ordinary shares of 10 per cent. per annum, and that the balance of £78,373 be carried forward. During the year four new steamers, representing 24,026 tons gross, have been delivered by the builders; against which there is the loss of five steamers, representing 27,543 tons gross. The insurance account amounts to £250,000.

COMPANY REGISTRATIONS.

Coaster Construction Company, Ltd.—Capital, £100,000, in £10 shares. Objects: To carry on the business of shipbuilders, marine, mechanical and electrical engineers, &c. Signatories:—

Geo. M. Welsh, 124, St. Vincent Street, Glasgow.

F. B. W. Niven, West Regent Street, Glasgow.

The first directors are: J. Gourlay, W. D. McLaren and G. M. Welsh. Solicitors: F. B. W. Niven. Private company.

Royal Sovereign Steamship Company, Ltd.—Capital, £15,000, in £1 shares. Objects: Shipowners, managers of shipping property, shipping agents, ship brokers, chartering agents, loading brokers, &c. Signatories:—

R. R. Shankland, 51, Totten Road, Highgate, shipbroker.

J. Shankland, 21, Fife's Row, Hampstead, N.W., shipbroker.

A. W. Pickard, 10, White Lodge, Chelsea, shipbroker.

The first directors are: R. R. Shankland, J. Shankland and A. W. Pickard (all permanent). Qualification, £250. Registered office: 7, Great St. Helens, E.C.3. Private company.

Wildman & Miller, Ltd.—Capital, £5,000, in £1 shares. Objects: Wharfingers, warehouse keepers, lightermen, storekeepers, carmen, jetty, pier and store proprietors, shipowners, tug and barge owners, &c., and to enter into an agreement with A. H. Wildman and E. E. Miller. Signatories:—

A. H. Wildman, 60, Holland Street, S.E.1, wharfinger.

E. E. Miller, 60, Holland Street, S.E.1, wharfinger.

The first directors are: A. H. Wildman (director and manager) and E. E. Miller. Qualification, £10. Registered office: 60, Holland Street, Blackfriars, S.E.1. Private company.

James Troop & Co., Ltd.—Capital, £10,000, in £1 shares. Objects: To take over the business carried on by J. H. Troop as "James Troop & Co.," and to carry on the business of engineers, founders, smiths, manufacturers, shipbuilders and repairers, buyers of ships (complete or incomplete, sound or out of repair) for the purpose of improving, re-selling, letting or turning to account the same, &c. Signatories:—

J. H. Troop, 20, Stoneby Drive, New Brighton, Cheshire, brassfounder and engineer.

W. Inglis, 3, Alresford Road, Aigburth, Liverpool, manager to engineer and brassfounder.

The first directors are: J. H. Troop (chairman) and W. Inglis. Qualification, £100. Registered office: 4, Pleasant Hill Street, Liverpool. Private company.

Victoria Steam Fishing Company, Ltd.—Capital, £30,000, in £10 shares. Objects: To take over the business of steam trawlers, line fishers, drifters, &c., at Grimsby or elsewhere. Signatories:—

W. Hill, Victoria Hotel, Cleethorpes, Lincs., licensed victualler.

R. Shute, 9, West Street, Cleethorpes, Lincs., fish merchant.

The first directors are to be appointed by the subscribers. Registered office: Fish Docks, Grimsby. Private company.

Anglo Marine Insurance Co., Ltd.—Capital, £100,000, in 99,500 ordinary shares of £1 each and 100,000 deferred shares of 1s. each. Objects: To carry on the business of marine insurance in all its branches, &c. Signatories:—

W. G. Okie-Curtis, 6, Vereker Road, West Kensington, W., insurance agent.

A. J. J. Pheazrey, 5, Holland Street, Kensington, W., merchant.

The first directors are A. Brewer, T. Jenkins, and I. D. Richards. Qualification: 100 shares. Registered office, 34, Gracéchurch Street, E.C. Private company.

QUESTIONS IN PARLIAMENT.

Labour Dispute in Dumbarton.

On Sir F. Hankey, March 20, asked the Secretary to the Admiralty whether at certain shipbuilding yards the joiners had been on strike for a considerable period owing to their refusal to do piece work.

Dr. Macnamara: Since February 21, 133 joiners have been on strike at one shipbuilding yard, that of Denny Bros., Dumbarton, on the ground mentioned. The Minister of Labour and the Navy Controller have interviewed the representatives of the Employers' Federation and of the society concerned, and in the meantime the union has given an undertaking to use its influence with the men to return to work. Some of the men have returned to-day. The men are on plain time-work pending further consideration of the matters under dispute and the action of the society therewith. Undoubtedly the action of the society and the men has caused delay to several vessels which are urgently required, amongst others one vessel of the type used for bringing men home on leave from the front. The joiners in the shipyards between the ages of 23 and 40 are at present exempted from military service.

Coasting Steamship Services.

Replying to Mr. Scanlan who, on March 20, drew attention to the threatened stoppage of the service of the steamship *Tartar* between Sligo and Belmullet, Mr. A. Samuels (Attorney-General for Ireland) stated: A resolution on the subject has been received from the Harbour Commissioners of Sligo, and the Irish Government is in communication with the departments concerned as to the possibility of securing the continuation of the steamship service.

Mr. Byrne asked the Parliamentary Secretary to the Shipping Controller, on March 21, whether he was aware that this week the Bristol boat had been removed from Dublin to a British port; whether he was aware that many industries would be injured and the trade of Dublin handicapped owing to the removal of this steamer; and whether he would see that this boat was restored to its Dublin trade.

Sir L. C. Money: The vessel referred to, in common with others in the home and coasting trades, has had to be withdrawn in order to meet an urgent Allied requirement. Every effort will be made to reduce the resulting inconvenience to a minimum.

Aliens in English Ports.

Answering Mr. R. McNair, on March 20, Dr. Macnamara, Secretary to the Admiralty, said: From information in the possession of the various Intelligence Departments responsible, there is no evidence to show that there are German spies in the Bristol Channel ports. The regulation of access to docks, whether at Liverpool or elsewhere, is in the hands of the competent naval and military authorities and the local police. These measures of restriction on aliens and strangers are, and have been, carried out in every possible way.

Interned Vessels.

Sir L. C. Money (Parliamentary Secretary to the Shipping Controller) informed Mr. Byrne, on March 20, that he was not aware of any interned enemy or Russian ships in British ports which were capable of being used in the war zone, and had not been so used since the outbreak of war.

Oil Production in the United Kingdom.

Captain Wright, on March 21, asked the Parliamentary Secretary to the Ministry of Munitions to state the name of the firm with which a satisfactory agreement had been come to by the Government to sink trial bores for oil.

Mr. Kellaway: At the moment the Government have under consideration applications to bore for petroleum from three different firms, and negotiations are practically completed, but, pending definite conclusion of the agreements, it is not proposed to publish the names. The agreements would give exclusive rights to bore within certain defined areas. Outside those areas, applications by colliery companies and others possessing freehold and surface rights over large districts and the necessary boring tackle will be carefully considered on their merits.

Losses from Mines.

Dr. Macnamara, replying to Commander Bellairs, on March 21, stated: Cases are not infrequent where it is impossible to say definitely whether a ship has been mined or torpedoed, but it can be stated with certainty that the losses from mines during the last seven months are very much fewer than during the previous seven months.

NEWS PARAGRAPHS.

Four Standard Ships Launched.—Harland & Wolff, Ltd., achieved the unique distinction of launching four standard ships on March 28. Two of these vessels were launched from the Belfast yards and two from the Scottish yards.

Ten 15,000-ton Ships for U.S.—According to a Reuter message from Washington, Mr. Harley, chairman of the Shipping Board, has recommended the construction of 10 ships of 15,000 tons each. Work on the design of these vessels, which will be the largest cargo carriers in the American merchant marine, has already been begun.

Free Navigation School.—Free navigation schools for seamen are now established and maintained by the Canadian Government at the ports of St. John, Yarmouth, Halifax, and North Sydney. The object of these schools is to furnish the necessary instruction in navigation and seamanship to seamen to enable them to become deck officers.

American Shipping for Switzerland.—A Reuter message from Washington states that the transfer of 5,000 tons of American shipping to Switzerland to take food supplies to that country is announced by the Shipping Board. Switzerland, it is understood, will secure a safe conduct from Germany for the transportation of the supplies to Cete (France).

The "Flandria" Steamship Company.—Mr. J. W. Lenson, 7b Calandstraat, Rotterdam, informs us that to avoid confusion of names with the "General Shipping Company 'Flevo'" (Algemeene Scheepvaartmaatschappij "Flevo") recently formed at Lemmer, the name of the shipping company under his management has been changed to "N.V. Scheepvaart Maatschappij 'Flandria'."

New Officers of Cardiff Chamber of Commerce.—Mr. T. J. Callaghan, the new President, has been intimately connected with business at Cardiff Docks for over 40 years as a shipowner, colliery owner, coal exporter, &c. Mr. W. R. Hann, vice-president, is the representative of the Powell Duffryn Steam Boat Company, Ltd., and the other vice-president, Mr. R. O. Sanderson, is a past-chairman of the Cardiff and Bristol Channel Shipowners' Association. The five new members of the council are:—Mr. J. P. Cadogan, Mr. Frank Fifoot, Mr. J. A. Jones, Mr. Dan Radcliffe, and Sir W. H. Seager.

Hawthorn, Leslie & Co.'s Apprentices.—The 20th annual examination of apprentices employed by R. & W. Hawthorn, Leslie & Co., Ltd., at their Hebburn shipyard, the St. Peter's Works and the Forth Banks, Newcastle, have just been held at Rutherford College with gratifying results. These annual competitions originated in 1895 on the attainment of the engineering jubilee of the late Mr. F. C. Marshall, a director of the company, who returned to the apprentices a silver cup presented to him by them on that occasion, to be competed for, the winner of the trophy being promoted to the drawing office, and the next highest to better positions in the shops. When Mr. Marshall died in 1903 a memorial to him by the officials, workmen and apprentices took the form of a scholarship. The prizes in the latest competition, when there were 152 candidates, were presented by Mr. A. C. Ross, C.B.E., managing director of St. Peter's Works. A welfare scheme is in operation in each of the firm's establishments for dealing with both the education and recreation of apprentices.

Showing Ships' Names.—An Admiralty notice to mariners published in the *London Gazette*, states that, as from March 1, every merchant ship entering a port within the United Kingdom is to display her name, painted in white letters on a black board, on the side on which she is approaching the examination steamer. She is also to display her name in this way at such other times and in such a manner as may be directed by the port authorities. The name is to be painted in block letters of a size to enable it to be read by the naked eye at a distance of twice the vessel's own length, in ordinary clear weather, whether by day or under search beam at night. Vessels of under 500 tons gross are to display one such board placed over the side near the vessel's bridge. Vessels of 500 tons gross and over are to display two such boards, one near the vessel's bridge and the other in the most conspicuous position over the side. The order, it is added, does not relieve a vessel of the necessity of complying with the Board of Trade requirements as to the proper equipment of signal flags. Another Order warns masters of steamships that they are to keep clear of convoys that they may meet or overtake. "The practice of cutting through a convoy is not permissible."

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"SHIPBUILDING AND SHIPPING RECORD" TABLE OF SHIP SALES.

Name and Type.	Tonnage.	Dimensions. Draught in ().	Sold by, to	Builders, hull and year.	Machinery and builders.	Remarks.
Don Neil , ss. (single dk.) (ex <i>Clara Jebson</i>)	1,735 gr. 1,103 net	250½' × 36½' × 16½'	Don S.S. Co., Manila, to Madrigal & Co., Manila	Chant Nav., Anversois, Antwerp (1902)	19, 31, 51 × 36 (N.E. Marine Eng. Co., Newcastle)	—
Eric Calvert , ss. (single dk.) (ex <i>Elmoille</i>)	1,862 gr. 1,173 net 2,700 d.w.	270½' × 37' × 18½' (19' 7")	Calvert S.S. Co., Goole, to buyers not stated	W. Gray & Co., W. Hartlepool (1889)	20, 31½, 53 × 36 (Cen. Mar. Eng. Wks., W. Hartlepool)	Price about £41,000.
Lotus , s.v.	400 gr. 380 net	150½' × 30' × 13'	J. Söderlund, Finland, to buyers not stated	J. Loel, Strigi, Isle of Oesel (1893)	—	—
Mars , ss. (single dk.)	3,550 gr. 2,236 net 6,000 d.w.	348½' × 49½' × 23½' (21' 6")	Brantingham S.S. Co., Newcastle, to the Globe Shipping Co., Cardiff	Furness, Withy & Co., W. Hartlepool (1907)	24, 39, 66 × 45 (Richardsons, Westgarth & Co., Hartlepool)	—
Orient , s.v.	519 gr. 479 net	156½' × 29½' × 16½'	Westergaard & Co., Christiania, to Mr. Rasmussen, Svendborg	Dundee S.B. Co., Dundee (1877)	—	—
Paso de los Lihes , ss. (single dk.) (ex <i>Sajonia II.</i>)	606 gr. 363 net	197' × 32½' × 9' (9' 6")	Marina Mercante Argentina, Buenos Aires, to buyers not stated	Nordsee Werke, Emden (1905)	10½, 15½, 20½ × 17½ (L. Frerichs & Co., Osterholz, Scharnbeck)	Price about £75,000.
Phoebe , ss. (pt. awning dk.)	2,754 gr. 1,755 net	312½' × 40½' × 21½' (22')	Turnbull Bros. Shipping Co., Cardiff, to Bede Steam Shipping Co., Newcastle	T. Turnbull & Son, Whitby (1894)	23, 37½, 61½ × 39 (T. Richardson & Sons, Hartlepool)	—
Yore , ss. (single dk.)	702 gr. 329 net 980 d.w.	180½' × 28' × 12' (12' 6")	Pile & Co., London, to buyers not stated	C. Rennoldson & Co., S. Shields (1917)	14, 23, 38 × 27 (W. Beardmore & Co., Glasgow)	Price about £50,000.

Mexican Port Pilotage.—The Secretary of Communications at Mexico City has issued instructions suppressing all charges for pilotage on both national and foreign vessels in the ports of Magdalena Bay, San Jose del Cabo, La Paz, Nuloge, Topolobampo, Altar, San Blas, Isles Marias, Las Penas, Zihuatanejo, Acapulco, Minizo, Port Angel, and San Benito, provided that no pilot is requested, and that the mails are carried free of charge.

Dutch Shipbuilding in 1917.—According to *Allgemeine Handelsblad* the total merchant tonnage launched last year by Dutch yards to home and foreign account, consisted of 87 steamships and 28 motor ships (total 167,000 tons gross), compared with 71 steamships and 1 motor ship (total 144,000 tons gross) during 1916. At the end of 1917 the merchant vessels under construction by or on order with Dutch yards, comprised 119 steamships and 21 motor ships (220,000 tons gross), compared with 119 steamships and 4 motor ships (265,000 tons gross) at the end of 1916.

Shipping Supervisions at U.S. Ports.—An *Exchange* message from Washington states that Mr. McAdoo has issued regulations, under the Espionage Act, for the control and supervision of the movement of vessels to and from United States ports, and also to supervise the loading and handling of explosives. The regulations greatly enhance the authority of port collectors, authorising them to inspect and search any vessel, package, or person on board, and to refuse clearance to foreign ports of vessels on which may be any person whose presence on board is inimical to the interests of the United States.

Quick Transit through Panama Canal.—Quick handling of a large ship through the Canal was one of the features of the traffic operations during December. The vessel had gross tonnage of approximately 15,000 tons and was 635 ft. in length, and the time taken for transit between the Canal terminals was 7 hours 26 mins.

FORTHCOMING EVENTS.

INSTITUTION OF CIVIL ENGINEERS.—Tuesday, April 9, meeting at the Institution, Great George Street, Westminster, S.W., at 5.30 p.m. Paper on "The Derwent Valley Waterworks," by Edward Sandeman, M.Sc., M.Inst. C.E.

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH SECTION).—Tuesday, April 9, meeting at 207, Bath Street, Glasgow, at 7.30 p.m. Paper by Mr. E. B. Wedmore on "The Control of Large Amounts of Power."

INSTITUTION OF ELECTRICAL ENGINEERS.—Thursday, April 11, joint meeting with Electrical Section of the Royal Society of Medicine, at the Institution of Civil Engineers, Great George Street, Westminster, S.W., at 6 p.m. Papers on "Medical Electricity," with exhibition of apparatus.

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.—Tuesday, April 9, meeting at Bolbec Hall, Newcastle-upon-Tyne, at 7 p.m. Paper by Colonel A. G. Haddock on "Internal Ballistics."

SHIPPING AND OTHER MEETINGS.

April 10 (Wed.)—Cammell Laird & Company, Ltd. (Ordinary General), Royal Victoria Station Hotel, Sheffield, at 12 noon.

SHIPPING SHARE MARKET.

The same influences that have acted on the other markets have naturally been experienced by the shipping section of the Stock Exchange. The great battle that is being waged in France absorbs attention, and although there is no sign anywhere in the markets of any fear of the outcome (any such condition would be immediately exhibited in a wholesale lowering of prices) it is only natural that there should be a disinclination to extend commitments for the time being. The approach of the Budget must also be expected to exercise for the next few weeks a depressing influence on the shipping market, particularly until it is seen how far shipping and shipbuilding enterprises are affected. The Easter holidays further explain the marked absence of business during the past week. Royal Mail stock was dealt in prior to the holidays at 122, the report of Lamport and Holt (in which the Royal Mail is interested as the controlling shareholder) being regarded as satisfactory. The reduced profits were anticipated, but a readjustment of various

items, including a reduction of income-tax and the insurance fund allocation, enables the same dividend of 10 per cent. to be paid as last year. The Furness Withy group have been lower in price and most of the leading counters have also been marked down a trifle. Such public interest as has been exhibited has again been in shipbuilding and the iron and steel companies' issues. Workington iron shares have shown a further improvement on the dividend, and the deal which has taken place between the company and the other steel concerns controlled by Samuel Fox & Co. and Steel, Peech & Tozer. Blaenavon and Ebbw Vales have also been in demand. A report reaches the market that an amalgamation between the Blaenavon and other larger concerns is pending. In the shipbuilding section all the leading issues have been in quiet demand, although the volume of buying is less than in previous weeks. Swan Hunters, Hawthorn Leslie's, the Palmer issues and Cammell Lairds, exhibit advances, but there was a rather weaker tendency in Armstrongs and in Vickers' issues. It is expected there will be a sharp recovery in the latter owing to the prolongation of the war output resulting from the recent developments in France.

SHIPPING, SHIPBUILDING, ENGINEERING AND MARINE INSURANCE SHARE LIST.

SHIPPING.							IRON AND STEEL.							
Name.	Share and paid.	Extreme quotations, 1917.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.	Name.	Share and paid.	Extreme quotations, 1917.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.	
African S.S.	£ 20	30½-25½	10	7½	28		Babcock & Wilcox...	Ord.	1	68/-52/6	15	4½	65/3	-2/10½
Allan Line	100	94-83	4	4½	92		Baldwins	Cum. pref.	1	20/-15/-	5½	5½	20/-	
Anchor Line	10	105½-102½	5½	5½	94		Do.	Deb.	Stk.	84-82	4½	5½	84	
Do.	Stk.	25/-14/3	6	4½	103		Bayliss, Jones	Cum. pref.	1	—	6	7½	11	
Argentine Nav.	1	20/6-6/6	Nil.	Nil.	23/3		Bell Bros.	Cum. pref.	10	10-9½	6	6	10	
Do.	Ord.	80½-79½	4	5	81		Do.	Deb.	Stk.	80-73½	5	7	74	
Australasian U. S. Nav.	Deb.	84-80	4½	5½	81		Bessemer (Henry)	Ord.	1	34/6-24/6	12½	7½	33/-	
Belfast Steam	10 (5pd.)	84-82	4½	5½	81½		Bolckow Vaughan	Ord.	1	30/-22/2	11	7½	29/6	
British & Argen. Nav.	Deb.	460-344½	50*	11½	427		Do.	Cum. pref.	20	17½-16½	5	5½	16/9	
British India Nav.	Deb.	105½-104	6	5½	102		Cargo Fleet Iron	Ord.	1	24/9-17/3	3	2½	25/-	-1/-
British S.S. Invest. Trust	Def.	74½-70	4½	6½	72		Do.	Deb.	100	84-81½	4½	5½	82	
Do.	Pref.	94-90	5	5½	90½-91		Consett Iron Co.	Ord.	1	36/3-24/10½	50	10	92/6	
Do.	Deb.	51/6-40/9	20½	8	54/-		Dominion Iron & Steel	Bds.	1	88½-71½	5	7	71	
Cairn Line	Bds.	55½-26½	25	5½	49	-1/9	Dorman, Long	Ord.	1	50/-30/9	8½	7	38/-	-1/-
Do.	Ord.	40/6-29/6	10	5½	34/6	-2/-	Do.	Deb.	Stk.	30/6-24/6	12½	9	28/9	
Clan Line	10	85/-63/9	20*	5	83/-		Guest, Keen & Ntelfs	Ord.	1	89/-62/6	15*	3½	85½	
Court Line	£1	97½-82	5	5½	97½		Do.	Cum. pref.	5	5½-5	5	4½	5½	
Cunard SS.	1	100-93½	4½	4½	103		Do.	Deb.	Stk.	79½-73½	4	5½	77	
Do.	Cum. pref.	95-89	4½	4½	103		Hadfield's Steel Foundry	Ord.	1	107/6-78/6	30	5½	117/6	
Do.	Deb.	19/-17/-	5½	6½	19/-		Ibbotson Bros.	5 (4 pd.)	7-6½	7½	6½	6½		
Elder Line	Stk.	89-85	5	5½	82½		Jessop (W.) & Sons	Ord.	5 (4 pd.)	10-8	15*	6	9½	
Elder Dempster	Cum. pref.	92-88½	6	5½	93		Lanarkshire Steel	Cum. pref.	10	25/-20/-	6	6	20/-	
Do.	Deb.	9-8½	4½	5½	8½		Lyssaght (J.)	Cum. pref.	1	19/9-19/4½	6	6	20/-	
Ellerman Lines	Pref. Ord.	95/3-85/-	5½	6½	87/6		Do.	2nd pref.	1	—	6	11	—	
Do.	Guar. pref.	60/9-41/6	20*	6½	65/7½	+7½	Manganese Bronze	Ord.	1	—	6	8	—	
France Fenwick	Cum. pref.	9-7½	5	5½	8½		Do.	Cum. pref.	Stk.	—	4	—	—	
Furness, Withy	Ord.	24/9-21/6	10	7½	29/9		North-Eastern Steel	Deb.	1	13/-9/9	Nil.	Nil.	13/9	
Do.	Cum. pref.	19/4½-15/-	5	6	15½	-1½	Palmer Ship & Iron "A"	Ord.	1	29/4½-21/3	15	10½	29/-	
General Steam Nav.	Ord.	82/6-75/-	5½	6½	80/-		Scott (Walter)	Ord.	1	19/9-16/-	6	7½	19/9	
Do.	Pref.	—	4½	4½	91		Do.	Pref.	1	—	15	4½	65/6	
Houlder Line	Cum. pref.	—	5½	6½	82		Sheffield Forge	Ord.	1	24/6-16/10½	7½	6	21/7½xd	
Do.	Deb.	11½-8½	6	5½	11½		Shelton Iron & Steel	Ord.	1	91½-91	5	5½	91½	
Houlder Bros.	Cum. pref.	97/6-87/6	6	6½	97/6		Do.	Deb.	100	42/9-29/6	10	4½	43/-	
Do.	Deb.	—	15	5	120		Do.	Cum. pref.	1	20/9-18/7½	6	6	20/9	
India Gen. Nav. & Rly.	Ord.	40/-24/-	20	12½	38/6		Do.	Deb.	Stk.	81-80	4½	5½	80	
Indo-China N.	Pref. Ord.	76/3-70/-	5½	7½	77/6		Steel Co. of Scotland	Ord.	10	17-16	10	6½	16	
Irrawaddy Flotilla	40	95½-93	4½	4½	94½		Stewarts & Lloyds	Pref. Ord.	10	—	6	4½	13½	
Khedivial Mail	1	42/6-31/6	16*	6½	49/6		Do.	Cum. pref.	10	8½-7½	5	6½	7½	
Do.	Pref.	20/4½-18/-	6	6	19/6		Stone (J.)	Cum. pref.	10	124-109½	8	7½	100½	
Do.	Deb.	8½-7½	5	5½	8½		Do.	Cum. pref.	100½	—	7	6	114½	
King Line	Ord.	30½-15	40	30½	21/-		United States Steel	Ord.	1	44/6-35/3	12½	5½	44½	
Lamport & Holt	Cum. pref.	21/-15/9	5	6½	21/-		Do.	Cum. pref.	Stk.	84-81	5	6	82	
Leyland (F.)	Cum. pref.	35-20	30	40½	98½	-4½	Do.	Deb.	Stk.	79-74½	4	5½	76	
Mercantile SS.	Ord.	—	5	5½	88½		Weardale Steel	Def. Ord.	1	32/3-23/-	19½	13½	28/9	
Do.	Pref.	87½-86½	4	4½	88½		Do.	Cum. pref.	1	25/3-18/9	6	5	25/-	
Moor Line	Ord.	25½-20	30	6½	24½		Do.	Deb.	Stk.	—	4	6	62	
Nelson Steam Nav.	Deb.	100/-90/-	5	5	94xd		Workington Iron & Steel	Ord.	1	30/3-21/-	10	6	28/9	+ -/6
New Zealand	Ord.	98½-84	4½	4½	94									
Do.	Stk.	92-88	4½	5½	88									
Nitrate Producers SS.	Ord.	93½-84	5	5½	91½									
Do.	Cum. pref.	342-295	18	5½	335									
Oceanic Steam Nav.	Deb.	65½-63½	3½	5½	64									
Orient. Stm. Nav. Co.	Cum. pref.	6½-3½	30	5½	115/-									
Do.	Deb.	125-109½	7	5½	121	-1								
P. & O. S. N.	Cum. pref.	85½-80	5	6	83½									
Do.	Def.	86-79	4½	5½	79½									
Do.	Deb.	87/6-80/-	5½	5½	85½									
Prince Line	1	6½-96/3	35	6½	58									
R.M.S.P.	Ord.	9½-9½	5	5½	99									
Do.	Pref.	75/-50/9	30	5½	105/-									
Do.	Deb.	72-7½	4½	6	71½									
Shaw, Savill & Alb.	Cum. pref.	90-86	4	4½	89									
Shell Transport	Ord.	72-7½	5½	6½	81½									
Do.	Cum. pref.	—	—	—	—									
Sutherland SS. Co.	£1	—	—	—	—									
Union-Castle SS.	Cum. pref.	—	—	—	—									
Do.	Deb.	—	—	—	—									
West Hartlepool	Pref.	—	—	—	—									

INSURANCE.						
Name.	Share and paid.	Extreme quotations, 1917.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.
Alliance	20 (24 pd.)	10½-9	12/-	7	92½	+ ½
London Assurance	25 (12½ pd.)	60½-48½	20	6	63½	+1½
Mercantile Marine Insurance	10 (2½ pd.)	10½-6½	10	6	10½	
N. British & Mercantile	Ord.	36-29	40/-	6½	34½	
Phoenix Assurance	10 (1 pd.)	7½-6	40/-	7	8½	
Royal Exchange Assurance	Stk.	24½-187	10	4½	251	+ ½
Sea Insurance	10 (2 pd.)	27½-24½	10	6	27	
World Marine, Limited	5 (2 pd.)	6½-55/-	5	4½	6	

SHIPBUILDING AND MARINE ENGINEERING.						
Name.	Share and paid.	Extreme quotations, 1917.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.
Armstrong, Whitworth	Ord.	1	45/-26/-	12½	5½	42/9
Do.	Cum. pref.	5	73/9-67/-	4	5½	67/6
Do.	Deb.	Stk.	78-73	5	6½	75½
Beardmore (W.)	Deb.	100	93-89	4½	5	90
Brown (John)	Ord.	1 (15s. pd.)	29/-22/9	12½	7	28/-
Do.	Cum. pref.	10	8½-7½	5½	5½	82½
Cammell Laird	Ord.	5	7½-6½	10	7½	61½
Do.	Cum. pref.	5	85/6-74/6	5	6½	83/6
Do.	Deb.	100	83½-79½	4½	5½	82
Dunlop (Jas.)	Ord.	1	28/9-16/-	10	9½	22/3xd
Do.	Cum. pref.	1	18/9-16/6	6	7½	17/6
Fairfield Shipbldg	Cum. pref.	10	8½-8½	6	7½	18½
Fleming & Ferguson	Ord.	10	—	10	7	18½
Gray (Wm.)	Deb.	100	100-95½	4½	4½	97½
Hawthorn (R. & W.) Leslie	Ord.	100	25½-15½	12½	5	29
Henderson (D. & W.)	Cum. pref.	1	10/3-5/-	Nil.	Nil.	9½
Richardson Westgarth	Ord.	1	19/9-12/6	Nil.	Nil.	17/9
Do.	Cum. pref.	1	67-62	4½	5	66
Do.	Deb.	Stk.	—	5	5	91½
Simons (W.)	Cum. pref.	10	51/-33/6	12½	5½	58½
Swan, Hunter & W. R.	Ord.	1	17/3-17/-	5	5½	17/-
Do.	Cum. pref.	1	78-77	4½	5	77
Thornycroft (John L.)	Ord.	1	45/-16/-	17½	8½	41/-
Do.	Cum. pref.	1	19/-16/-	6	6½	18½
Do.	Deb.	100	—	5	6	82
Wallend Slipway	Ord.	1	2-1½	10	2	72/6xd
Do.	Cum. pref.	1	1-1	5	5	1

INSURANCE.

Alliance	20 (2½ pd.)	10½-9	12/-	7	9½	+ ½
London Assurance	25 (12½ pd.)	60½-48½	20	6	63½	+ 1½
Merchants' Marine Insurance	10 (2½ pd.)	10½-8½	10	6	10½	
N. British & Mercantile Ord.	25 (6½ pd.)	36-29	40/-	6½	34½	
Phoenix Assurance	10 (1 pd.)	7½-6	40	7	8½	
Royal Exchange Assurance	Stk.	241½-187	10	4½	251	+ ½
Sea Insurance	10 (2 pd.)	27½-24½	10	6	27	
World Marine, Limited	5 (2 pd.)	8½-55/-	5	4½	6	

* Including bonus.

† Also 20 % in shares.

‡ Treasury price.

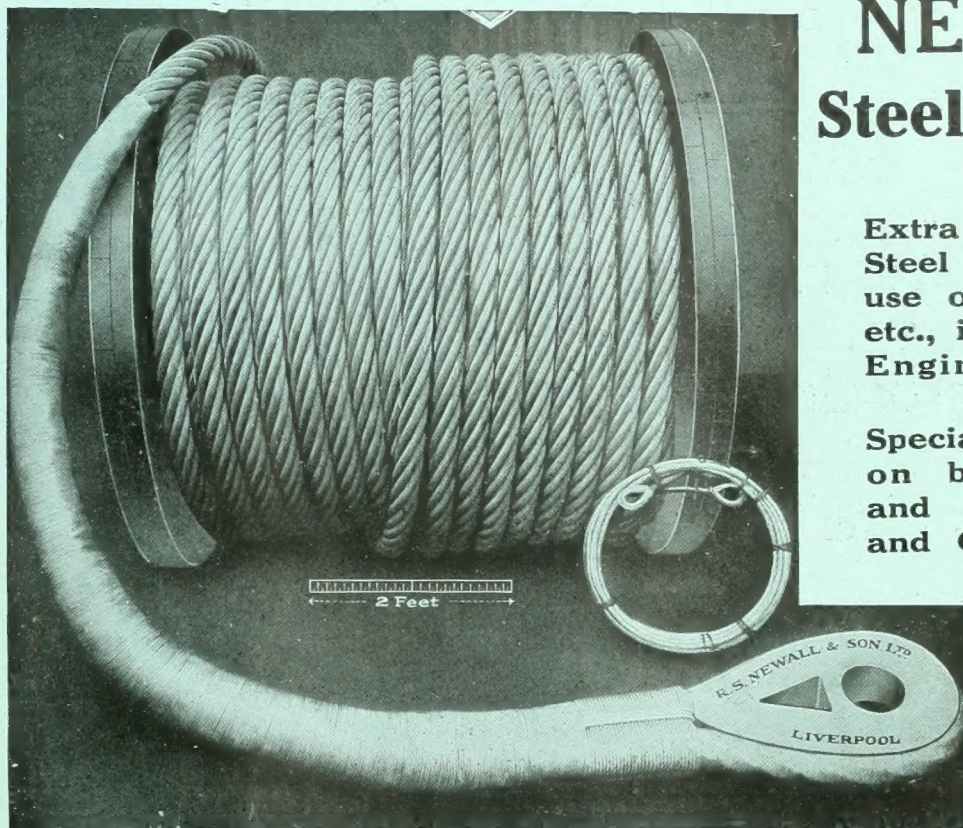
SHIPBUILDING AND MARINE ENGINEERING.

Armstrong, Whitworth Ord.	1	45/-36/-	12½	5½	42/9	
Do.	Cum. pref.	5	73/9-67/-	4	67/6	
Do.	Stk.	78-73	5	6½	75½	
Beardmore (W.)	Deb.	100	93-89	4½	90	
Brown (John)	1 (15s. pd.)	29/-22/9	12½	7	28/-	-3
Do.	Cum. pref.	1	8½-7½	5	8½	
Cammell Laird	Ord.	5	7½-6½	10	7½	5½
Do.	Cum. pref.	5	85/6-74/6	5	83/6	
Do.	Deb.	100	83½-79½	4½	84	
Dunlop (Jas.)	Ord.	1	25/9-16/-	10	9½	22/3xd
Do.	Cum. pref.	1	18/9-16/6	6	7	17/6
Fairfield Shipbldg Cum. pref.	10	8½-8½	6	7	8½	
Fleming & Ferguson	Ord.	10	—	10	14½	
Gray (Wm.)	Deb.	100	100-95½	4½	97½	
Hawthorn (R. & W.) Leslie Ord.	10	25½-15½	12½	5	29	
Henderson (D. & W.) Cum. pref.	1	—	5	9	—	
Richardson Westgarth Ord.	1	10/3-5/-	Nil.	Nil.	9½/10½	+10½
Do.	Cum. pref.	1	19/9-12/6	Nil.	17/9	+ -1½
Do.	Deb.	Stk.	67-62	4½	66	
Simons (W.)	Cum. pref.	10	—	5	91½	
Swan, Hunter & W. R.	Ord.	1	51/-33/6	12½	5½	58½
Do.	Cum. pref.	1	17/3-17/-	5	17/-	
Do.	Deb.	Stk.	78-77	4½	77	
Thornycroft (John I.)	Ord.	1	45/-16/-	17½	41/-	
Do.	Cum. pref.	1	19/-16/-	6	18/10½	+ -4½
Do.	Deb.	100	—	5	82	
Wallend Slipway	Ord.	1	2-1½	10	72/8xd	
Do.	Cum. pref.	1	1-1	5	1	

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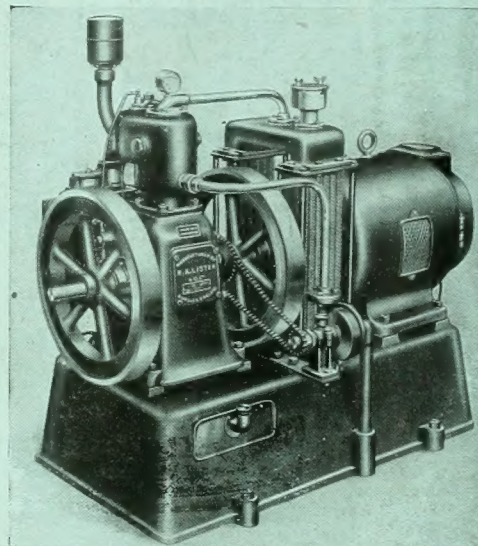
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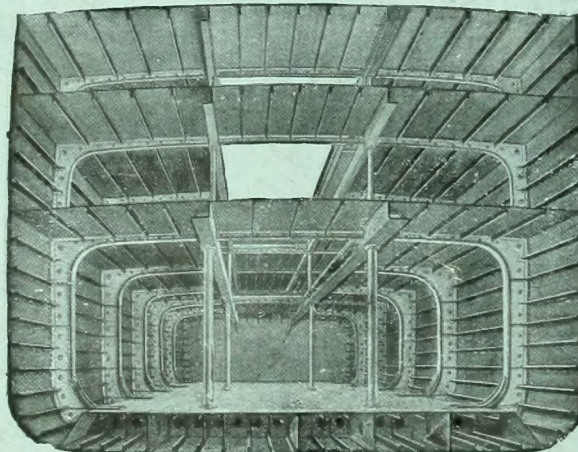
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